EWM120

Customizing Additional Topics in Extended Warehouse Management (EWM)

PARTICIPANT HANDBOOK
INSTRUCTOR-LED TRAINING

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UNIT 1 EWM Analytics

Lesson 1

Using Monitoring and Analytical Functions 2

UNIT OBJECTIVES

- Use monitoring and analytical functions

Unit 1
Lesson 1

Using Monitoring and Analytical Functions

LESSON OVERVIEW

In this lesson you learn about the warehouse management monitor.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use monitoring and analytical functions

Warehouse Management Monitor

The warehouse management monitor is the primary tool used by warehouse managers for information about the current situation in the warehouse, enabling them to initiate the appropriate responses to critical situations. It also contains alert monitoring capabilities that highlight actual and potential problematic situations in the warehouse and provides exception handling tools.

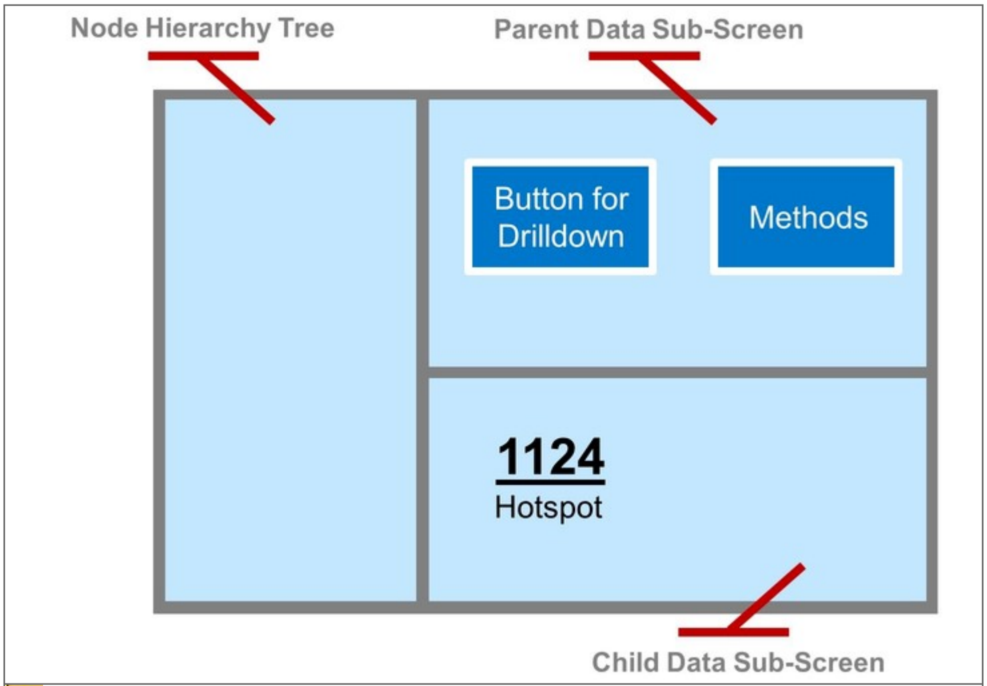


Figure 1: Warehouse Management Monitor

Warehouse Management Monitor Features

The warehouse management monitor offers the following features:

- Node hierarchy tree
- Parent and child data
- List and form views
- Methods
- Hotspots
- Customizing options

Node Hierarchy Tree

The node hierarchy tree contains all of the predefined nodes representing different object classes. The tree is used solely for navigation purposes. You can use the node hierarchy tree to display, in the upper view area, object information for a specific node, based on selection criteria.

The warehouse management monitor contains nodes for object classes relating to the following:

- Documents such as warehouse requests (WRs), warehouse orders (WOs), warehouse tasks (WTs), and physical inventory documents
- Processes such as stock and bin, and resource management
- Alerts such as overdue waves or overdue deliveries without goods issue/goods receipt

Parent Data and Child Data

Besides the navigation tree you have two sub-screens. One sub-screen is used to display the data of the parent objects. The other sub-screen displays the data of the child objects.

List and Form Views

By default, object information is displayed as a list view. The list view is displayed in an ALV grid, and offers all standard ALV functionalities, including sorting, filtering, and printing.

You also have the option of toggling to a form view for a selected object. The form view provides a focused view of the object and more-detailed information than the list view. The form view is displayed in an HTML viewer.

Methods

When object information is displayed in either view area, you can call methods to perform actions on selected objects.

Hotspots

By using hotspots for output fields in the ALV list, the corresponding user interface can be called for an object. For example, clicking the warehouse task number calls the warehouse task display transaction.

Customizing Options

You can use the standard SAP monitor or you can create your own monitors for the use in your company in Customizing.

Regardless of whether you use the standard SAP monitor or your own monitor, the end users can tailor it to their needs by either creating variants for the standard nodes, or creating new variant nodes, based on the standard nodes. A user can also hide nodes or complete branches that they do not need, or create nodes with a given layout for the ALV list view.

Measurement Services and Warehouse Cockpit

Measurement services use key figures delivered by the warehouse. Examples of warehouse key figures are as follows:

- Outbound or inbound deliveries that have left or arrived in the warehouse
- Number of handling units
- Number of open warehouse tasks or warehouse orders

Firs, you require **basic** measurement services. Then, to evaluate the key figures, you use **tailored** or **calculated** measurement services.

Basic, Tailored, and Calculated Measurement Services

Basic measurement services are the key figures that can also be found in the warehouse management monitor to display, for example, a list of warehouse tasks, and show the total number of these warehouse tasks. They have assigned the functions modules for queries, selection screens, and the node profiles that define them for the warehouse management monitor. They are grouped in **basic measurement service groups**

For a **tailored measurement service**, you assign a selection variant to a basic measurement service to specify the key figure that you want to see. It is based on the basic measurement service that you select. For example, you are only interested in open warehouse tasks. Additionally, you can assign upper and lower threshold values for alerts and exceptions that can be triggered if thresholds are violated.

In a **calculated measurement service**, you connect multiple tailored measurements services in a mathematical formula. Here, you can check the effectiveness of your warehouse or the performance of your employees.

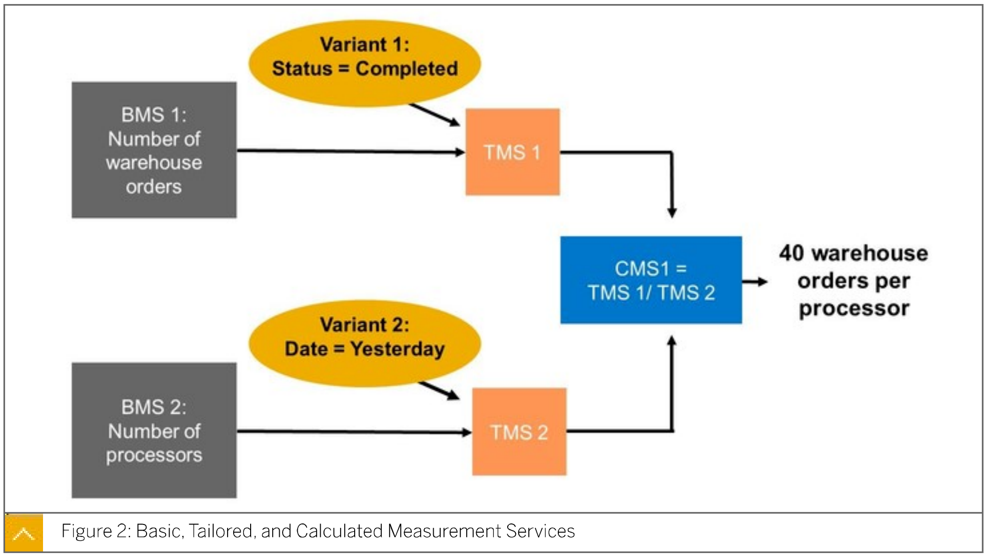


Figure 2: Basic, Tailored, and Calculated Measurement Services

Measurement Services Uses

Measurement services can be used in:

- Operational planning in Labor Management and for the calculation of engineered labor standards

- The Warehouse Cockpit
- BI Content for SAP EWM

Warehouse Cockpit

You can use the **Warehouse Cockpit**to display your warehouse key figures and defined Easy Graphics Framework (EGF) objects graphically, and to evaluate or monitor them using defined chart types. It enhances text-based SAP solutions, and was developed to be implemented in a strategically-oriented warehouse. The Warehouse Cockpit supports new processes, such as working with analytical functions when managing a warehouse using SAP EWM.

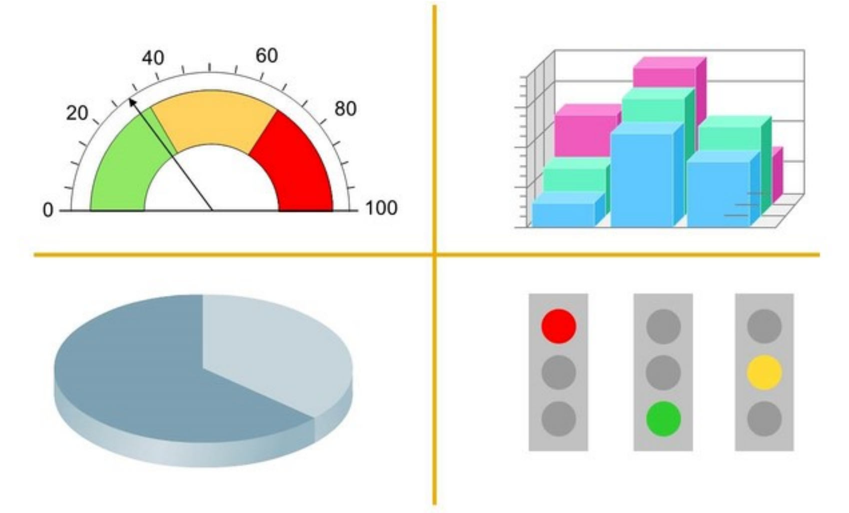


Figure 3: Warehouse Cockpit and Easy Graphics Framework

Analytical Functions

This component provides an analytical tool that facilitates the transition from an administration-oriented warehouse to a strategically-orientated warehouse. Key figure functions and functions for graphical analysis, monitoring, or control enable you to analyze your warehouse. SAP NetWeaver Business Intelligence (BI) provides data warehousing functionality, a business intelligence platform, and a suite of business intelligence tools. Relevant business information from productive SAP applications and external data sources can be integrated, transformed, and consolidated in BI with the toolset provided. BI provides flexible reporting, analysis, and planning tools to support you in evaluating and interpreting data, and tools for distributing information.

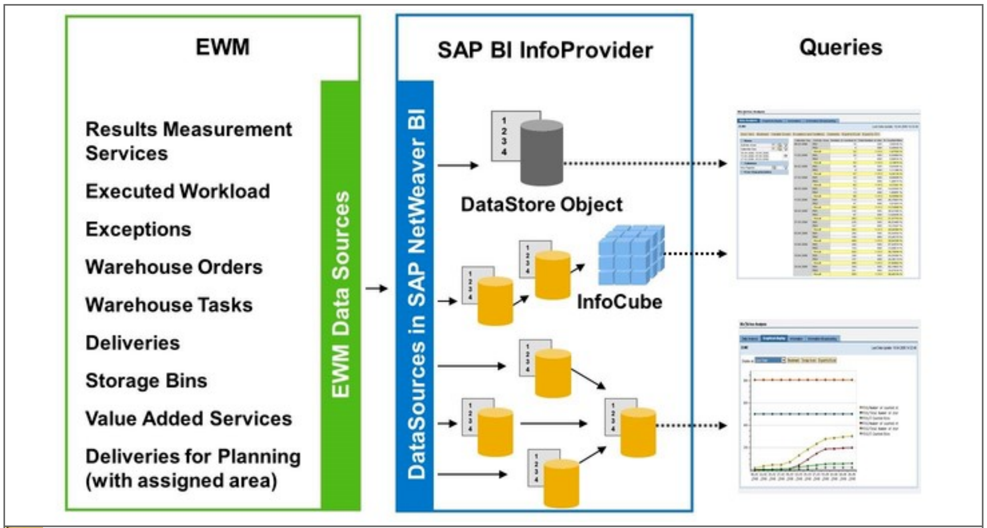


Figure 4: Analytics and Strategic Planning with SAP NetWeaver Business Warehouse

SAP EWM System

SAP delivers **BI Content** for SAP EWM to enable you to analyze your warehouse, offering key figure functions and functions for graphical analysis, monitoring, and control.

BI Content is a preconfigured set of role-related and task-related information models that are based on consistent metadata in SAP NetWeaver Business Intelligence. BI Content provides selected roles within a company with the information that the roles need to perform their tasks.

This information model includes integral roles, workbooks, queries, InfoSources, InfoCubes, DataStore objects, key figures, characteristics, update rules, and extractors for SAP applications.

BI Content

BI Content can be used in the following ways:

- As is, in specific industries
- Adapted, so that you can work with it to any degree of detail
- As a template or as an example for customer-defined BI Content

InfoArea **0WM** consists of BI Content for SAP EWM. You can use it to conduct actual and planned data analyses for warehouse management, using reporting methods. This enables you to develop a strategy to improve efficiency in your warehouse. You can plan your work better, develop your warehouse strategy, and monitor and constantly check how individual scenarios affect your business targets.

The data basis provided by the BI Content contains, for example, the following data flows:

- Measurement Service Results
- Executed Workload
- Exceptions
- Warehouse Order - Warehouse Task

- Delivery Items
- Storage Bins
- Value-Added Services
- Strategic Planning

SAP HANA-based Operational Reporting

SAP HANA Live provides a higher quality of analytics and reporting capabilities for the SAP Business Suite. It defines access to applications like SAP EWM through standard protocols and interfaces (OData, SQL, and MDX). It also exposes a data model that is easy to understand (business semantics instead of technical DB field names), and is tailored to analytical use cases. However, this data model stems from the table design of existing Business Suite solutions like SAP EWM. The data model of the SAP Business Suite, generally optimized for data throughput in transactional scenarios, has been adapted for SAP HANA analytics to support easy consumption based on operations provided by the SAP HANA database. This adaptation has been achieved by the definition of a layered set of database views, which is referred to as virtual data model (VDM). The top layer of VDM provides customers and partners with views that they can consume easily using various tools (for example, BOBJ tools) or technologies (for example, SAP Smart Business or HTML5).

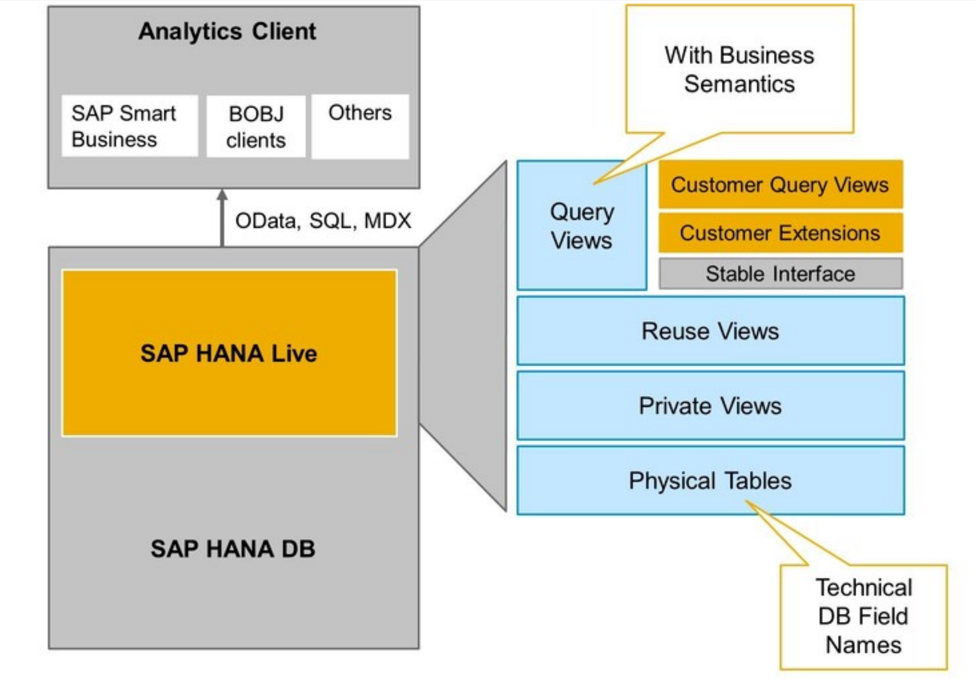


Figure 5: SAP HANA Live

SAP Smart Business for EWM

SAP Smart Business for EWM is an SAP Smart Business cockpit that provides you with an overview of the most important key performance indicators (KPIs) for a warehouse shift supervisor. It allows the warehouse shift supervisor to monitor the workload for his or her shift for outbound deliveries, to determine overdue outbound deliveries or outbound delivery items in real-time, and to monitor the average goods issue delay time.

You will find KPIs for the following in the Smart Business KPI repository warehouse:

- Number of outbound deliveries
- Number of outbound delivery items
- Volumes of outbound delivery items
- Weight of outbound delivery items
- Overdue outbound deliveries
- Overdue outbound delivery items
- Average goods issue delay time

By applying parameters such as warehouse number, and filters, such as dates, times, and document types, you further refine the KPIs to meet your needs.

> Note:
> Dynamic time setting, such as time = today + current time, is possible and enables auto-refresh.

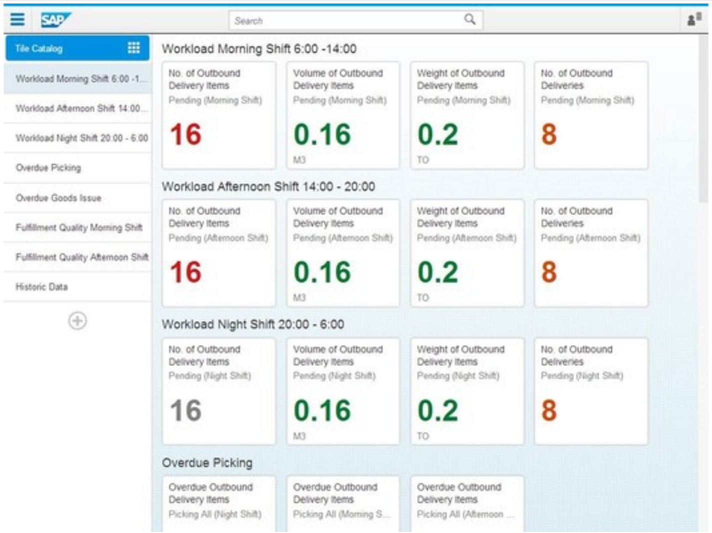

Search
Tile Catalog
Workload Morning Shift 6:00 -1...
Workload Afternoon Shift 14:00...
Workload Night Shift 20:00 - 6:00
Overdue Picking
Overdue Goods Issue
Fulfillment Quality Morning Shift
Fulfillment Quality Afternoon Shift
Historic Data
Workload Morning Shift 6:00 -14:00
No. of Outbound Delivery Items Pending (Morning Shift) 16
Volume of Outbound Delivery Items Pending (Morning Shift) 0.16 M3
Weight of Outbound Delivery Items Pending (Morning Shift) 0.2 TO
No. of Outbound Deliveries Pending (Morning Shift) 8
Workload Afternoon Shift 14:00 - 20:00
No. of Outbound Delivery Items Pending (Afternoon Shift) 16
Volume of Outbound Delivery Items Pending (Afternoon Shift) 0.16 M3
Weight of Outbound Delivery Items Pending (Afternoon Shift) 0.2 TO
No. of Outbound Deliveries Pending (Afternoon Shift) 8
Workload Night Shift 20:00 - 6:00
No. of Outbound Delivery Items Pending (Night Shift) 16
Volume of Outbound Delivery Items Pending (Night Shift) 0.16 M3
Weight of Outbound Delivery Items Pending (Night Shift) 0.2 TO
No. of Outbound Deliveries Pending (Night Shift) 8
Overdue Picking
Overdue Outbound Delivery Items Picking All (Night Shift)
Overdue Outbound Delivery Items Picking All (Morning S...
Overdue Outbound Delivery Items Picking All (Afternoon ...

Figure 6: SAP Smart Business EWM

LESSON SUMMARY

You should now be able to:

- Use monitoring and analytical functions

Unit 1

Learning Assessment

1. What is the function of the warehouse cockpit?

Unit 1

Learning Assessment - Answers

1. What is the function of the warehouse cockpit?

   You can use the warehouse cockpit to display your warehouse key figures and defined Easy Graphics Framework (EGF) objects graphically, and to evaluate or monitor them using defined chart types.

UNIT 2

Extension of Work with Deliveries

Lesson 1

Setting Up Value-added Services 12

Lesson 2

Setting Up Cross-docking 18

Lesson 3

Creating Direct Outbound Deliveries 27

UNIT OBJECTIVES

- Use Value-Added Services
- Set up cross-docking
- Define the settings for direct outbound deliveries in SAP EWM
- Execute the outbound delivery process

Unit 2
Lesson 1

Setting Up Value-added Services

LESSON OVERVIEW

In this lesson, you learn about value-added services and how they are set up. You also find out how value-added services can be used in inbound and outbound processes. Finally, you learn about the settings for the auxiliary product consumption posting.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use Value-Added Services

Value-added Services

Value-added services (VASs) enhance the value of a product in the warehouse.

A value-added service order (VAS order) is used to perform these services in the warehouse through VAS activities, and document the services. Typical VAS activities include assembling products, packing products, labeling, or kitting. Here, both the goods receipt process and the goods issue process in the warehouse change. Ideally, you can then use process-oriented storage control to execute interim steps before final putaway or before staging in the goods issue area. In these interim steps, the VAS order defines which product processing must be performed by warehouse employees in the work centers. You can also use a VAS order in the goods issue process to assemble kits for your customers, and to pack them on a customer-specific basis using the VAS order.

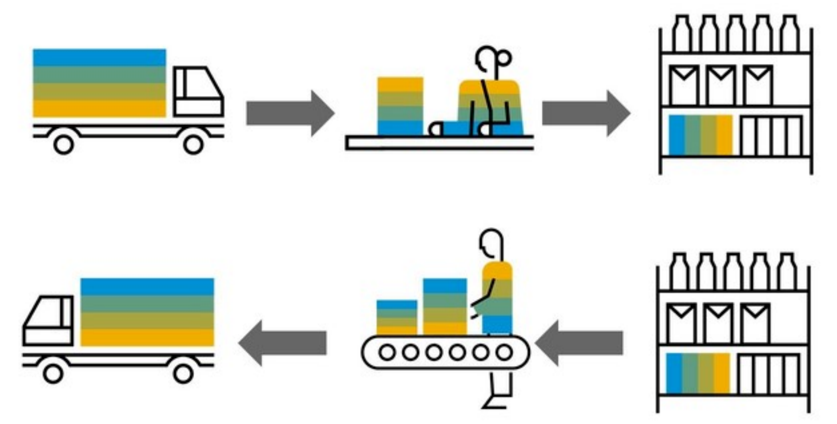


Figure 7: Value-added Services

Performing Value-added Services

The VAS order is an instruction to perform a value-added service for one or more products with reference to a delivery item. It links delivery items to a packing instruction and contains details from within the delivery and packaging specification. With this document, you can inform warehouse employees about they work they must perform, and on which products. You can also use VAS orders to log completed tasks.

Value-added Service Instructions

You must always create a VAS order on the basis of a delivery and a packaging specification.

Work Centers for Value-added Services

The VAS activities are completed at work centers that are designed specifically for these kinds of activities.

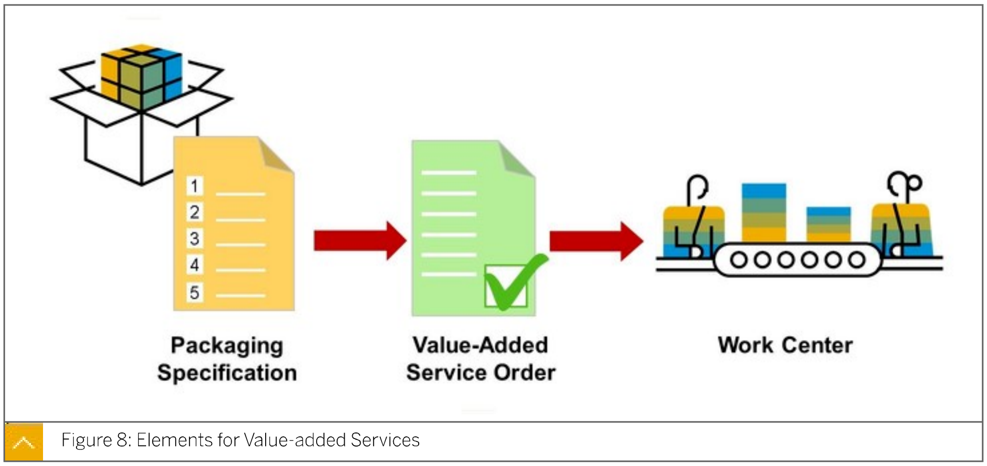


Figure 8: Elements for Value-added Services

Value-added Service Process

Value-added services can be used in inbound or outbound processes. In the outbound process, you can also use the VAS order to assemble the kits at the work centers (Kit-to-Order).

As a prerequisite, an inbound delivery or an outbound delivery order must exist, along with a valid packaging specification. Then, the system can create a VAS order. If you want to map the automatic creation of warehouse tasks as an interim step in the system for work centers, where you are executing value-added services, you must have already configured process-oriented storage control in Customizing.

Depending on how you use storage control, the following options are available in the goods receipt or the goods issue process for performing value-added services using a VAS order.

Value-added Services with Process-oriented Storage Control

If you are using process-oriented storage control, the system proceeds as follows:

1. For each item, the system determines the corresponding packaging specification.
2. The system creates a VAS order based on the inbound delivery or the outbound delivery order.
3. The system then creates handling unit warehouse tasks that contain a work center as the destination storage location in accordance with the VAS order. Here, each VAS activity represents a separate process step with a corresponding warehouse task. You can define as many interim steps as required. All of these interim steps are deemed VAS possible.
4. After completing all value-added services, the products reach the goods issue area or the final storage bin.

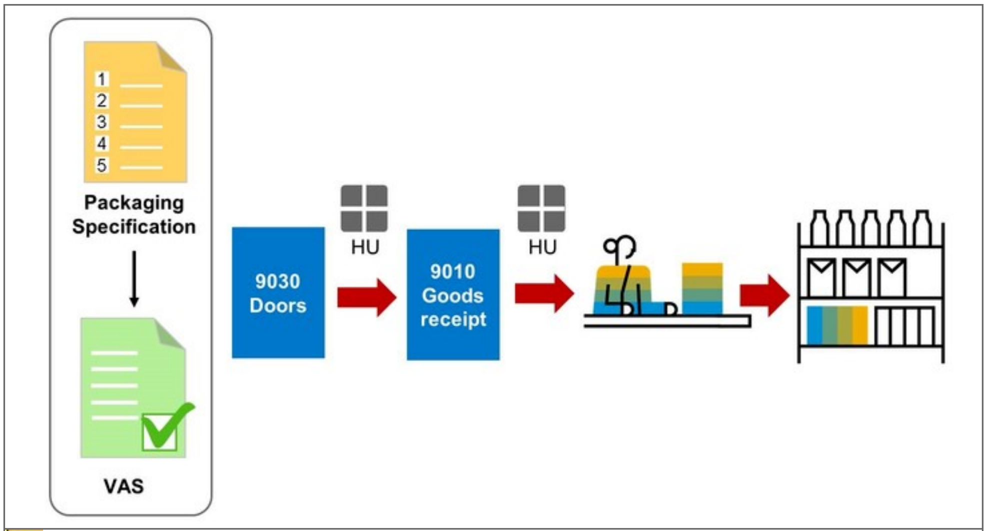


Figure 9: Value-Added Services with Process-Oriented Storage Control

Value-added Service With Process Step

If you have only defined the individual process steps, and are not using process-oriented storage control, the system proceeds as follows:

1. The system creates a VAS order based on the inbound delivery or the outbound delivery order.
2. For each item, the system determines the corresponding packaging specification.
3. The system then creates product warehouse tasks that contain a work center as the destination storage location in accordance with the VAS order. Each VAS activity represents a separate process step with a corresponding warehouse task. You can define as many interim steps as required.
4. After completing all value-added services, the products reach the goods issue area or the final storage bin.

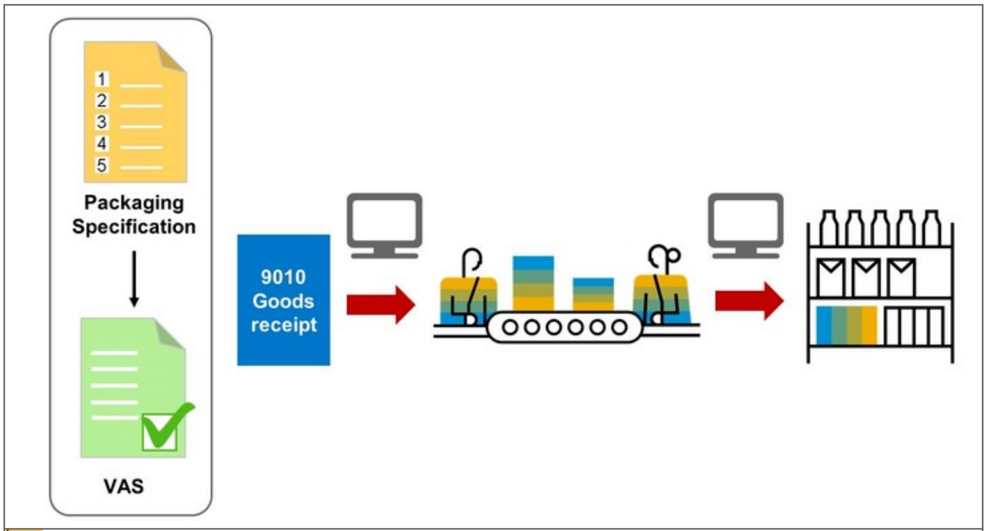


Figure 10: Value-added Service With Process Step (Without Process-oriented Storage Control)

Value-added Service Without Process Step

If you are not using process-oriented storage control, and you have not defined any process steps, the system proceeds as follows:

1. The system creates a VAS order based on the inbound delivery or the outbound delivery order.
2. For each item, the system determines the corresponding packaging specification.
3. You print out the VAS order and the warehouse employees perform the VAS activities at the work centers manually.
4. When the VAS activities are completed, you can enter a confirmation in the system. The product is then moved to the final storage bin or the goods issue area.

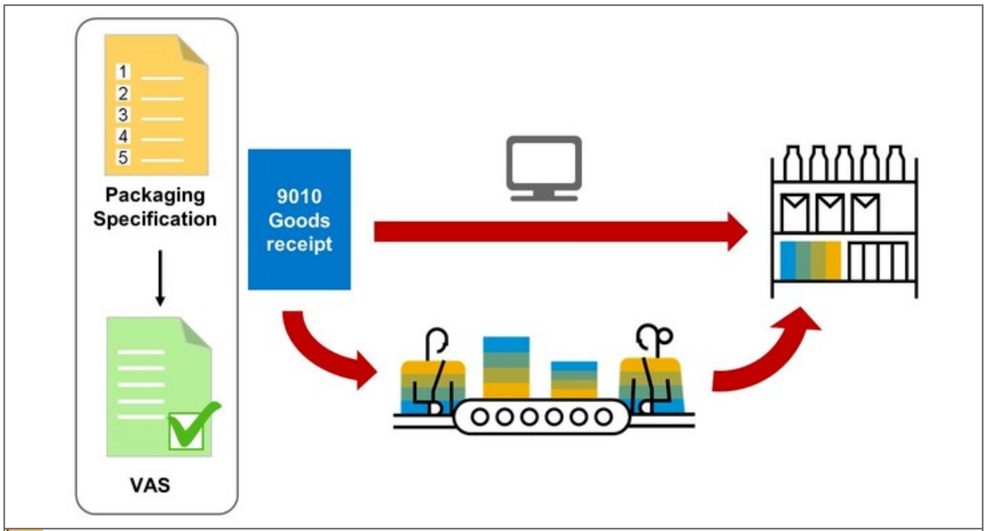


Figure 11: Value-added Service Without Process

Auxiliary Product Consumption Posting

For the value-added services performed at the work centers, you can record which auxiliary products you used for particular activities, and in what amounts.

Required settings for the consumption posting are as follows:

- You have set the *Consumption-Relevant for VAS* indicator in the storage data of the product master for the products for which you want to record consumption posting.
- You have assigned a storage bin to a work center or to a warehouse number from where you post the auxiliary products in the goods issue. The stock of the auxiliary products is located in this storage bin, and this stock is then also consumed by this storage bin as part of the value-added services.
- You have maintained a packaging specification and have assigned auxiliary packaging materials to the packaging specification levels (such as preservation or packing into individual containers).
- If you want to use customer-specific movement types in the SAP ERP system, you can define these in Customizing.

  If you do not define your own, the standard movement types 291 and 292 are used for consumption posting in the SAP ERP system.

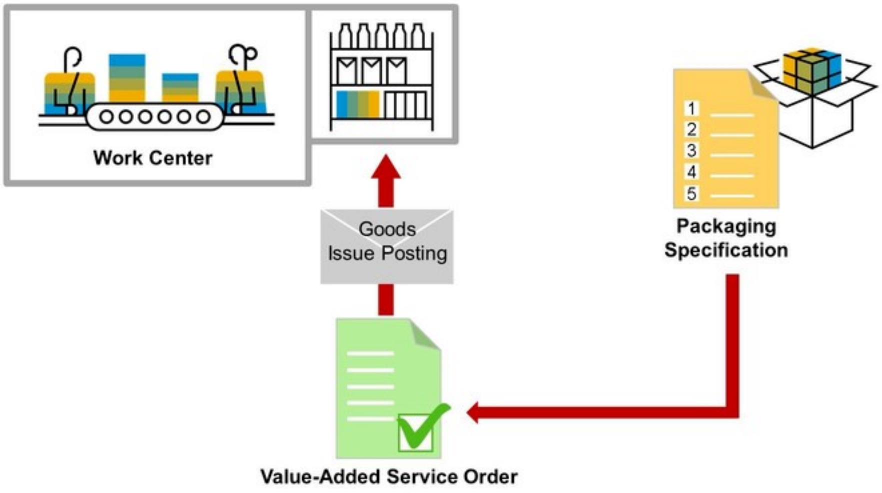


Figure 12: Auxiliary Product Consumption Posting

Determine Quantity of Auxiliary Products

The system uses the following criteria to automatically determine the quantity of the respective auxiliary products that is to be posted:

- The status confirmation for a VAS order
- The VAS activity confirmation
- The quantity confirmation for a VAS activity

The system determines the respective quantities by using quantity ratios in the packaging specification of the products being processed. However, you can also manually overwrite the quantity determined by the system (such as for unplanned overconsumption or underconsumption).

When you save the confirmation, the system performs consumption posting for the auxiliary products. You can also change the quantities of auxiliary product that have already been posted. If you enter a negative value for the quantity of auxiliary product being posted, the consumption is reduced and the system increases the stock in the storage bin. If you enter a quantity to be posted additionally, you can increase the consumption at a later time.

LESSON SUMMARY

You should now be able to:

- Use Value-Added Services

Unit 2
Lesson 2

Setting Up Cross-docking

LESSON OVERVIEW

In this lesson, you learn about the different cross-docking possibilities in SAP EWM. This lesson also deals with planned cross-docking, opportunistic cross-docking, transportation cross-docking, and EWM-triggered cross-docking.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up cross-docking

Reasons for Cross-docking

Cross-docking is the practice of unloading materials from an incoming vehicle and loading these materials directly into outbound vehicles, with little or no storage in between. You can use a cross-docking process in a distribution center or warehouse to process products and handling units (HUs) efficiently and to minimize unnecessary load transfer activities. Reducing the time in storage in the warehouse reduces stockholding costs. In the case of transportation cross-docking (TCD), you can also optimize transportation costs.

Using cross-docking enables you to find and fulfill urgent sales orders or reduce processing and sales costs.

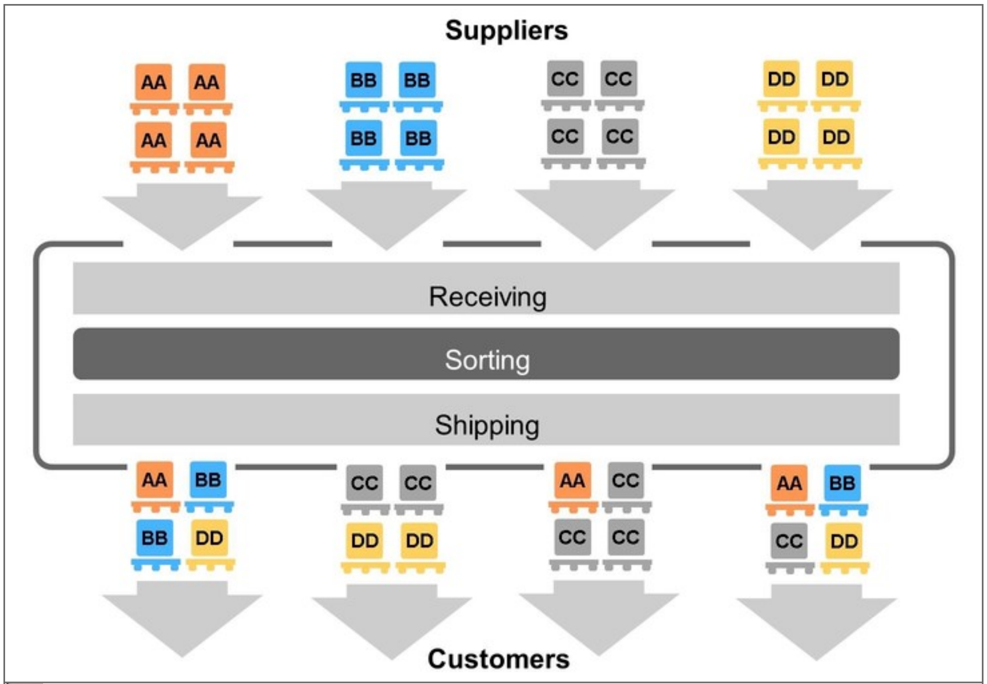


Figure 13: Cross-docking

Cross-docking Possibilities in Extended Warehouse Management

There are several possibilities in SAP EWM for cross-docking. First, you must distinguish between **planned** cross-docking and **opportunistic** cross-docking.

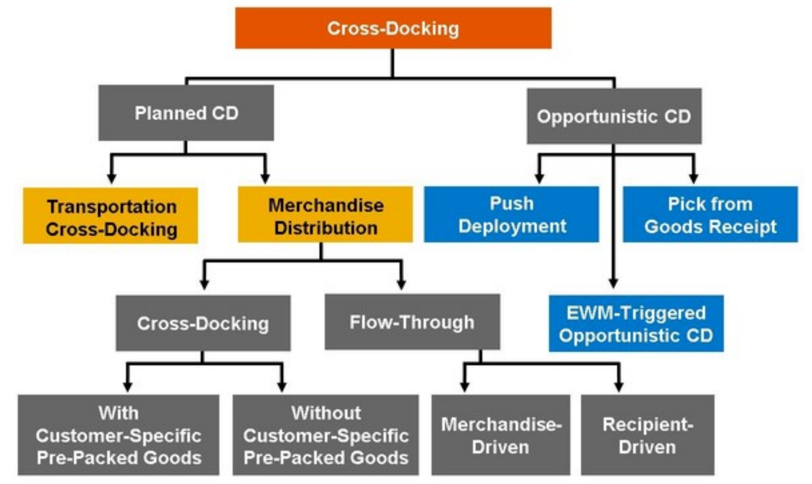


Figure 14: Cross-docking Scenarios in EWM

Planned Cross-docking

For planned cross-docking, you define, in Customizing, how the cross-docking process is to proceed. The cross-docking relevance is, therefore, already defined before stock arrives, and before you post the goods receipt or release the outbound delivery. You can use TCD or merchandise distribution.

Transportation Cross-docking (TCD)

TCD supports the transportation of HUs across different distribution centers or warehouses, up to the final destination. This can involve switching the means of transport, consolidating multiple deliveries to new transports or processing export activities centrally. If the final destination is a distribution center or warehouse at the customer site, a sales order in SAP Customer Relationship Management (SAP CRM) or SAP ERP forms the basis for TCD. However, you can also use TCD to transport HUs to your own final warehouse. In this case, a stock transfer order forms the basis for TCD.

When you pick a TCD-relevant HU, SAP EWM uses a stock removal HU warehouse task (stock removal HU-WT) to update the corresponding inbound delivery and the corresponding outbound delivery order simultaneously. In SAP EWM, you can use the warehouse management monitor to display the TCD-relevant inbound deliveries and outbound delivery orders. The monitor only gives you information about the current process status. However, the transportation cross-docking monitor in SAP ERP offers an overview of the complete process up to that point.

The restrictions of TCD are as follows:

- TCD does not support returns.
- If you use nested mixed pallets in TCD, a subordinate HU can contain either TCD-relevant delivery items only or non-TCD-relevant items only.
- Non-domestic locations in the supply chain in TCD can only be supported if they are the final place of destination.
- Transportation planning in SAP ERP and SAP Transportation Management for outbound deliveries and outbound delivery orders foreseen for cross-docking is not supported. The same applies to transportation planning in SAP ERP for inbound deliveries in the cross-docking facilities.

Merchandise Distribution

You can use merchandise distribution to plan and control your flow of goods flexibly, enabling you to move goods efficiently through a warehouse. For the merchandise distribution, you use the following warehouse-internal processing types:

- Merchandise distribution cross-docking
- Recipient-driven flow-through
- Product-driven flow-through

Note:
You are using SAP enhancement package 4 for SAP ERP 6.0 with business function Retail, CD/FT_EWM Integration, and your system is configured as SAP Retail.

Merchandise Distribution Cross-docking

Merchandise distribution cross-docking allows you to plan, control, and process the flow of goods from the vendor through a warehouse to the recipients, such as stores or customers. Merchandise distribution supports the push and pull method in SAP ERP, and enables cross-docking in the warehouse.

Flow-through

When you receive goods, you may be unable to send the goods to a final ship-to party completely. This can affect products that are delivered in an unpacked state, or whole HUs. Here, you can move the goods after goods receipt to a cross-docking storage type that you are using as a repacking area.

- Recipient-driven flow-through

  In recipient-driven flow-through, you put together one pick HU for each customer. As a picker, you pick up the pick HU, and go to the storage bins. You put the products into the pick HU, and take the entire packed pick HU to goods issue.

- Product-driven flow-through

  In product-driven flow-through, you distribute the contents of the incoming HUs to customer-specific pick HUs. As a picker, you pick up the delivered HU, and go to the pick HUs into which you have to distribute the products. You therefore perform deconsolidation and fill the pick HUs. You then perform picking and take the completely packed pick HUs to goods issue.

Opportunistic Cross-docking

In opportunistic cross-docking, you work with standard inbound and outbound deliveries and start the standard goods receipt process or goods issue process. You determine the cross-docking relevance after the goods have entered the warehouse.

Push deployment (PD) and pick from goods receipt (PFGR) are opportunistic cross-docking processes. When you post the goods receipt, SAP EWM checks whether the warehouse process type and stock type are relevant for putaway delay. If they are relevant, SAP EWM delays the generation of the warehouse tasks for putaway. SAP Advanced Planning & Optimization (SAP APO) defines whether an inbound delivery is PD-relevant or PFGR-relevant. SAP APO defines the cross-docking relevance after posting goods receipt.

Process Variants

The following process variants exist for determining the cross-docking relevance and additional process steps.

Push Deployment (PD)

> You can use PD to execute stock transfers for delivered products from one warehouse to another at short notice, without having to put away the goods.

Pick from Goods Receipt (PFGR)

> In PFGR, you can confirm a sales order that is not yet confirmed using the Availability-to-Promise (ATP) check by posting goods receipt for an inbound delivery. You can perform this picking from directly within the goods receipt area. Unlike the standard pick procedure, you do not have to put away the products.

SAP EWM-triggered Opportunistic Cross-docking

> This process takes place entirely in SAP EWM. When SAP EWM generates putaway or pick-warehouse tasks, it defines whether opportunistic cross-docking is to take place,

that is, whether the inbound delivery or outbound delivery order item is relevant for cross-docking. You can activate this cross-docking procedure for the inbound and outbound delivery process separately at the warehouse or product level.

Transportation Cross-docking

The decision to use transportation cross-docking is made by SAP EWM during the **route determination of the outbound delivery order**For this, special routes called cross-docking routes are required. The SAP EWM route determination determines all suitable routes between the starting point and the destination (which can be a customer or another warehouse). The result can either be a linear route, which is direct, or a cross-docking route. A cross-docking route may be faster than a linear route as departures on the linear route may be infrequent, while departures on the cross-docking route may occur daily.

> Note:
> As SAP S/4HANA embedded EWM does not offer this route determination, transportation cross-docking is not available.

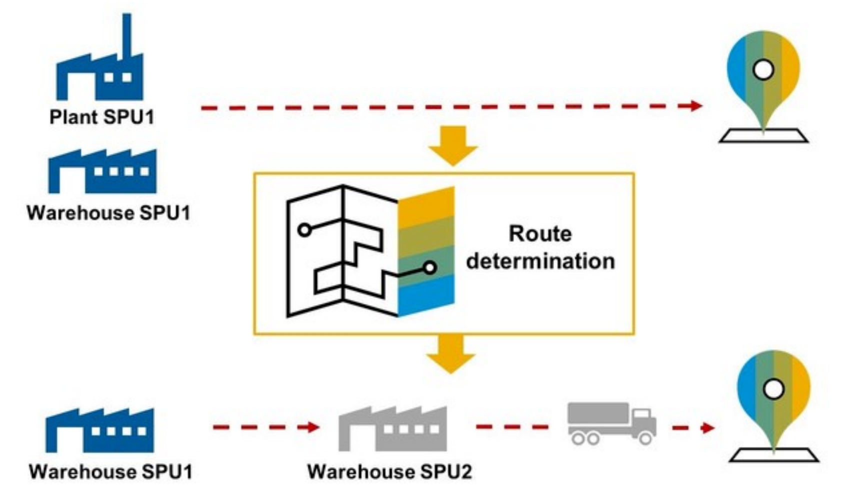


Figure 15: Transportation Cross-docking Scenario

Once a cross-docking route is assigned, the ship-to-party in the outbound delivery request is replaced by a cross-dock warehouse and the original ship-to party is assigned to the partner role *final ship-to party*.

The goods issue is posted by SAP EWM for the outbound delivery order and transferred to SAP ERP (with the cross-docking route and final ship-to party). SAP ERP then creates a pair of deliveries: an inbound delivery into the cross-docking warehouse and an outbound delivery from the cross-docking warehouse to the final location. When the goods arrive in the cross-docking warehouse, the handling units are unloaded from the truck and moved directly from the inbound area to the outbound area.

Nested Handling Unit

This basic scenario can be extended by using storage control if you are working with a nested handling unit. You receive an inbound delivery with a nested putaway HU that contains two further products. SAP EWM determines that TCD is necessary for an HU (TCD HU) and that the other HU is for putaway (putaway HU). SAP EWM determines a goods receipt (GR) storage process for the highest-level putaway HU. The highest-level putaway HU correspondingly runs through all steps of the GR process, including deconsolidation. During deconsolidation, you unpack the TCD HU and the lower putaway HU from the highest-level putaway HU and then pack both of them into a further HU. You move the TCD HU to the goods issue (GI) zone after deconsolidation. If EWM determines a storage process for process-oriented storage control in GI for this TCD HU after deconsolidation, EWM processes the individual steps according to the warehouse process. You perform the further steps of putaway for the putaway HU.

Organizational Structures and Additional Settings

During TCD, the stock remains in the ownership of the sending warehouse. Only the final goods issue posting from the last cross-docking warehouse removes the stock from the triggering plant. Therefore, TCD requires special cross-docking storage locations for each plant that can trigger a TCD process.

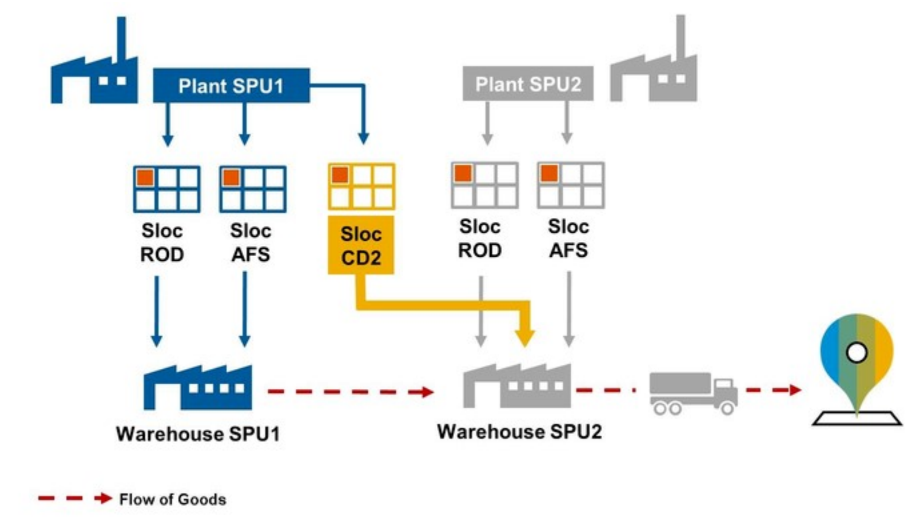


Figure 16: Organizational Structure for Transportation Cross-docking

Supplier Cross-docking

Supplier cross-docking allows you to integrate a cross-docking warehouse into the inbound delivery process from the supplier to the destination warehouse. It is assumed that information about the cross-docking warehouse to which the goods from the supplier are to be shipped is provided by customer-specific enhancements in the ASN IDoc submitted by the supplier.

Additionally, you have to implement the Business Add-In PARSING_IDOC and GN_DELIVERY_CREATE of BAdI /SPE/INB_ID_HANDLING to retrieve the information about the receiving cross-docking warehouse from the IDoc and to transfer this information to delivery processing. As an alternative, you can implement method PROPOSE_CD_PLANT of BAdI /SPE/BADI_DETERMINE_CD_PLANT to determine the receiving cross-docking information internally. For both methods, you also have to implement method FILL_OUTBOUND_DELIVERY of BAdI /SPE/CD_FILL_OUTBOUND_DELIVERY to determine essential data needed for creating the cross-docking outbound delivery.

EWM-triggered Cross-docking

EWM-triggered opportunistic cross-docking does not need any other application or system for the cross-docking decision. You activate this cross-docking variation with the usage of product groups and product group types, which means it is generally product controlled whether a cross-docking is to be completed or not.

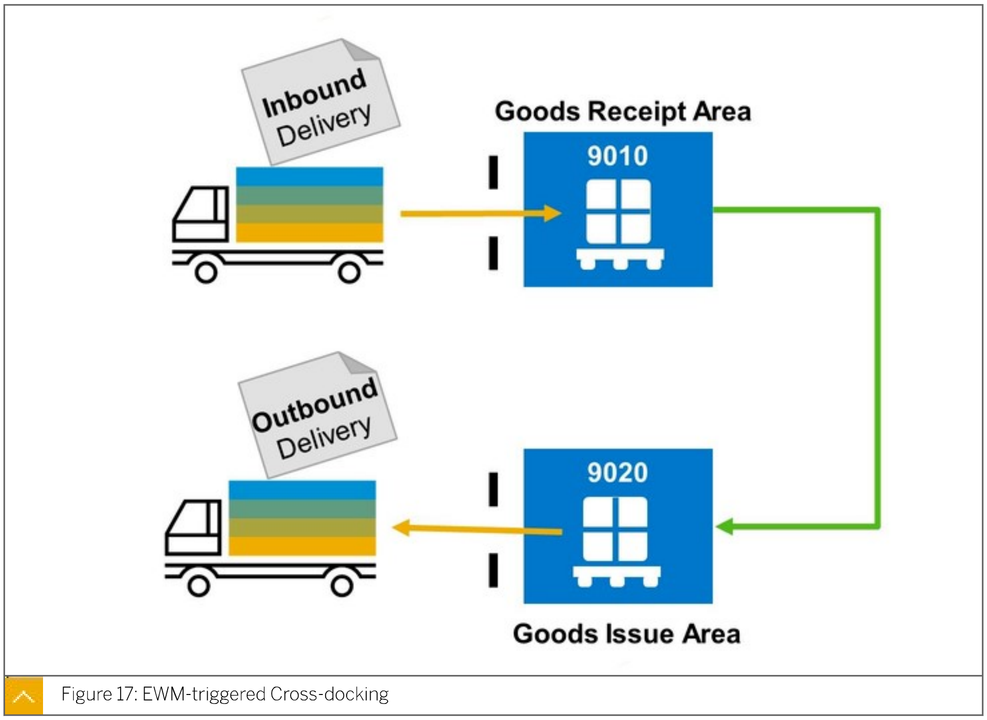


Figure 17: EWM-triggered Cross-docking

EWM-triggered Cross-docking in the Inbound Delivery Process

SAP EWM defines whether the inbound delivery is relevant for cross-docking. You can use this process when you generate warehouse tasks for the putaway. SAP EWM checks whether the inbound delivery suits an existing outbound delivery order item in terms of the following criteria:

- Product
- Batch
- Quantity, including stock separation characteristics, such as party entitled to dispose or the sales order stock. In this case, you can take the stock directly from goods receipt to goods issue.

The process can be performed with or without storage control.

Process Steps

The process steps for the inbound delivery process are as follows:

1. SAP EWM creates an inbound delivery.
2. You post the goods receipt.

3. You generate the warehouse tasks for putaway. At the same time, SAP EWM looks for suitable delivery items in existing outbound delivery orders based on the active Business Add-In (BAdI) implementation. SAP EWM checks whether delivery items of an outbound delivery order exist whose outbound delivery stock is suitable in terms of products or batch and quantity.

    - If SAP EWM is unable to determine any delivery items of this kind, it continues with the standard goods receipt process and generates the related warehouse tasks for putaway.

    - If SAP EWM is able to determine delivery items of this kind, it checks whether it has already generated pick warehouse tasks for these delivery items, which are assigned to the RF environment.

      If open pick warehouse tasks of this kind exist, SAP EWM cancels these without violating the first in, first out (FIFO) principle. SAP EWM generates relevant new pick warehouse tasks and assigns to these the stock that you want to put away. This enables you to pick the stock directly, without having to perform putaway. If the outbound delivery stock found by SAP EWM is less than the delivered stock, SAP EWM generates a warehouse task for putaway for the remaining delivery quantity.

4. You perform picking or putaway and confirm the pick warehouse tasks or warehouse tasks for putaway.

5. SAP EWM updates the inbound delivery and the outbound delivery order.

EWM-triggered Cross-docking in the Outbound Delivery Process

SAP EWM defines whether the outbound delivery order is relevant for cross-docking. When you generate warehouse tasks for the outbound delivery order, you can use this process to have SAP EWM check the stock in the goods receipt. In this process, SAP EWM checks whether stock exists in the goods receipt, which is more suitable than the stock in the warehouse. Here, you can take the stock directly from goods receipt to goods issue. You can only perform the process without using storage control.

Process Steps

The process steps for the outbound delivery process are as follows:

1. SAP EWM creates an outbound delivery order.

2. You generate warehouse tasks for the stock removal.

   At the same time, SAP EWM looks for suitable warehouse tasks with reference to an existing inbound delivery, based on the active BAdI implementation. Here, SAP EWM checks whether the goods receipt contains stock that is more suitable for fulfilling the outbound delivery order item than the stock in the warehouse.

    - If SAP EWM is unable to determine any delivery items of this kind, it continues with the standard goods issue process and generates the related warehouse tasks for stock removal.

    - If EWM is able to determine delivery items of this kind, it checks whether it has already generated putaway warehouse tasks for these delivery items, which are assigned to the RF environment. If open putaway warehouse tasks of this kind exist, SAP EWM cancels these without violating the FIFO principle. SAP EWM generates relevant new pick warehouse tasks and assigns to these the stock that you want to putaway. This enables you to pick the stock directly, without having to perform putaway. If the stock found in the goods receipt is less than the required stock, SAP EWM generates additional pick warehouse tasks for the open quantity, which refer to stock in the warehouse.

- If SAP EWM only determines open putaway warehouse tasks, which you process on paper only, SAP EWM does not take these into account, thereby avoiding data inconsistencies. If you print out putaway warehouse tasks, and confirm the putaway on the printout, you do not save this data immediately in SAP EWM. In this case, no current data for the status of the putaway warehouse task is available to SAP EWM, from which it can trigger a cross-docking process.

3. You confirm the pick warehouse tasks.
4. SAP EWM updates the inbound delivery and the outbound delivery order.

LESSON SUMMARY

You should now be able to:

- Set up cross-docking

Unit 2
Lesson 3

Creating Direct Outbound Deliveries

LESSON OVERVIEW

In this lesson, you learn about the reasons for direct outbound deliveries in SAP EWM. You are also be shown how to perform the settings for direct outbound deliveries.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Define the settings for direct outbound deliveries in SAP EWM
- Execute the outbound delivery process

Direct Outbound Delivery Orders

This document is triggered in the warehouse directly. SAP EWM sends the direct outbound delivery order to SAP ERP. This contains the SAP ERP document number. The structure and data of the direct outbound delivery order match those of an outbound delivery order that is triggered in SAP ERP.

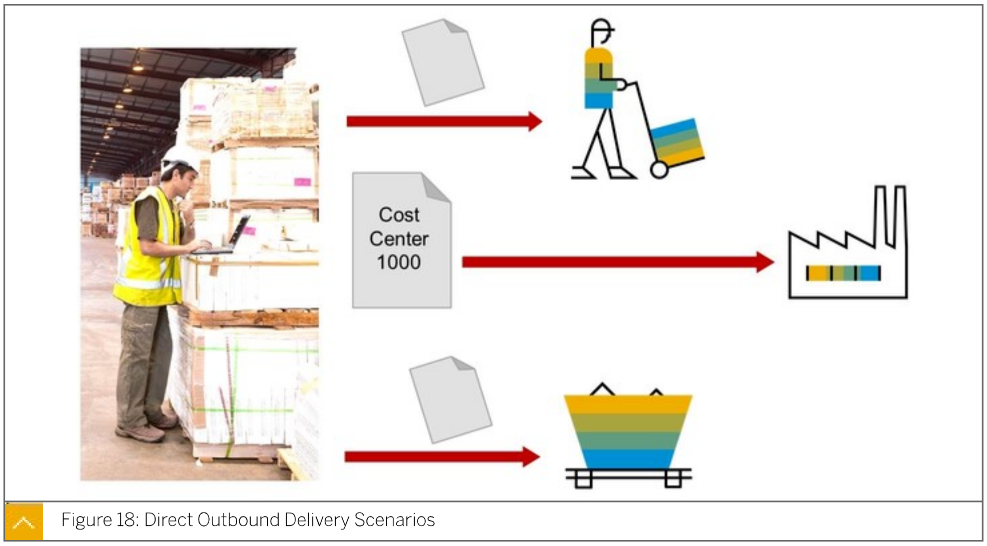


Figure 18: Direct Outbound Delivery Scenarios

Scenarios for Direct Outbound Delivery Orders

You can use direct outbound delivery orders in the following scenarios:

Direct Sales

Because the customer asks for the goods and picks them up on-site in the warehouse, transportation activities do not apply. You do not need to create a sales order for this.

The direct outbound delivery order forms the basis for the delivery in SAP ERP. The delivery in SAP ERP forms the outbound document for billing.

Account Assignment

Unlike for direct sales, you post a goods issue with account assignment for the goods. This can be completed for the cost center.

Scrapping

The direct outbound delivery order for scrapping forms the last step in the scrapping process. You post the goods to be scrapped with the goods issue from the warehouse stock. You trigger this locally in the warehouse.

Immediate deliveries

You can fulfill immediate deliveries and choose between a push and pull procedure as follows:

In the push procedure, you make a decision for the outbound delivery without a sales order from the current requirements of the warehouse. For example, you want to use your available transportation capacities efficiently by making use of unused space in a vehicle; or you have to consider the special requirements of the consumer products industry, for example, you want to distribute a very recent delivery containing fresh goods (lettuce) to outbound deliveries going to different stores.

In the pull procedure, the store or customer triggers the process. For example, you only notice later that an article in the last purchase order was not included. You call the warehouse and trigger immediate delivery to deliver the goods on time.

Kit-to-stock or reverse kitting

Here, you use a VAS order to create a kit from different components. If you want to reserve the corresponding components, you can use a direct outbound delivery order. When you have created the kit and posted goods issue for the direct outbound delivery order, SAP EWM reduces the stock of the respective components.

Properties of Direct Outbound Delivery Orders

Direct outbound delivery orders have the following properties that differentiate them from outbound delivery orders that were generated in SAP EWM based on outbound deliveries created in SAP ERP:

- The availability check is necessary, because this check is usually triggered in SAP ERP.

  Because direct outbound delivery orders are created in SAP EWM directly, no availability check is performed in SAP ERP for the required product. Instead, SAP EWM triggers the availability check. Depending on the configuration, the check can be performed in SAP ERP or in SAP APO.

- Organizational and logistically relevant delivery data that is copied to outbound delivery orders from SAP ERP preceding documents must be specified for the direct outbound delivery orders locally in EWM. Either you enter the data directly, such as the product or quantity, or EWM determines the data automatically using configuration data, such as the goods issue bin for items that are not pick-relevant.

  Because you start the goods issue process using direct outbound delivery orders in EWM, the underlying document type must display the process correspondingly. EWM uses the process profile to do this. When generating a direct outbound delivery order, you must select the correct document type to ensure the process flow is correct.

- Because no outbound delivery request from SAP ERP exists for direct outbound delivery orders, actions such as splitting direct outbound delivery orders are not possible. Direct outbound delivery orders are also always checked, meaning they have the status type Locked (unchecked item) and status value No, and are immediately ready for processing.

Constraints

- You cannot use credit management for direct outbound delivery orders.
- The price determination in SAP ERP does not provide you with the same functions as the price determination in the sales order.
- You cannot use any configurable products in direct outbound delivery orders.
- You cannot perform billing in SAP CRM for direct outbound delivery orders.
- You cannot extend bills of materials in direct outbound delivery orders.
- SAP ERP does not send messages for a direct outbound delivery order to SAP EWM.
- If you are adding packing items to a direct outbound delivery order, SAP EWM cannot perform an availability check for these new delivery items.
- The kit-to-order process does not support direct outbound delivery orders.
- Direct outbound delivery orders are not relevant for backorder processing in SAP Advanced Planning and Optimization (SAP APO).

Direct Outbound Deliveries Settings in SAP EWM

For the direct outbound delivery you need delivery documents in SAP EWM. Because you directly create the outbound delivery order ,which is a warehouse request, you do not need an outbound delivery request. For these cases the document chain consists of only two documents — the outbound delivery order and the outbound delivery.

Sales Organization

If you manually create an outbound delivery order, SAP EWM cannot copy any data from a predecessor document, such as the sales organization, since direct outbound deliveries do not have predecessor documents. SAP EWM requires a sales organization to carry out a GTS check. In Customizing, you can assign a party entitled to dispose with its sales organization to a warehouse number. When you create an outbound delivery order, you do not have to enter a sales organization since SAP EWM automatically copies the specified sales organization.

For the assignment, please choose in Customizing: *Extended Warehouse Management* → *Interfaces* → *GTS Integration* → *Assign Sales Organization to Warehouse Number.*

Availability Check

If you want to perform an availability check, you must specify the product, quantity, and stock type for the item. If you fail to specify a batch for a product that is subject to batch management, or if SAP EWM is unable to determine one, SAP EWM performs a batch-independent availability check. If you enter the batch at a later time, SAP EWM performs the availability check again, but batch-independently.

Availability Check in SAP EWM

If you have defined an availability check in Customizing, SAP EWM automatically performs an availability check in one of the following ways, according to your Customizing settings:

- Call availability check in SAP APO.

When SAP APO executes an availability check, SAP APO generates pre-persistent **temporary quantity assignments** (TQAs), which reserve the quantities temporarily. When SAP EWM saves the associated outbound delivery order, SAP APO changes these pre-persistent TQAs to persistent TQAs. SAP ERP then later converts these persistent TQAs into reservations for the delivery quantities.

If SAP APO is not available and is therefore not able to perform the availability check, SAP EWM continues with the outbound delivery process. Here, EWM confirms the requested delivery quantity and sends the data to SAP ERP. SAP ERP sends this data to SAP APO as soon as SAP APO is available again. If backorder processing is required due to this current data, SAP APO triggers this.

- Call availability information in SAP ERP.
- Call availability check in SAP EWM.

  This check only works on the basis of the availability known in SAP EWM, and only considers stocks that do not refer to a delivery.

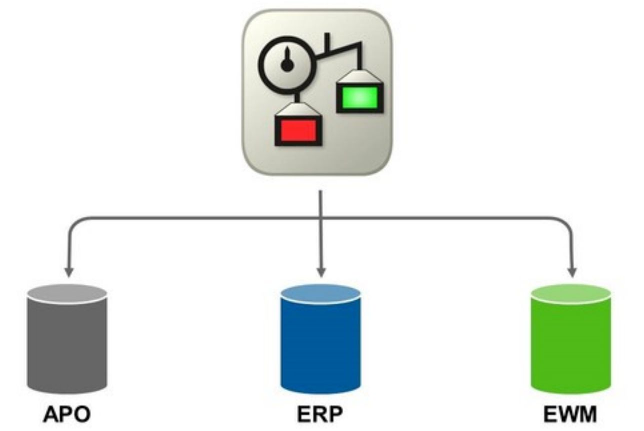


Figure 19: Availability Check in Direct Outbound Deliveries

Confirmation

If SAP APO, SAP ERP, or SAP EWM are able to confirm all quantities and do not change the inspection type automatically, you can check this confirmation by using the status or the additional quantities. In the detailed view of the item, choose the *Status* tab page. For the status type *DAV Availability check* , the status value is *Confirmed*. In the detailed view of the item, choose the *Additional Quantities* tab page. EWM shows you the quantities in the role for the quantity. For example, you have requested 10 pieces of product A for a delivery item. The *reduced quantity* is 10 pieces, the *open quantity* is zero, and the *requested quantity* is 10 pieces.

If SAP APO, SAP ERP, or SAP EWM can only partially confirm the requested quantities or change the inspection type automatically, SAP EWM displays a dialog box. Here you can find the following information:

- Check status, for example, *Partially Checked*
- Inspection type, for example, *Availability Check in EWM*
- Requested quantity

- Available quantity
- Confirmation date or time

Partial Confirmation

For a partial confirmation, SAP EWM also shows you the following:

- Reduced delivery quantity in the relevant item

  For example, you requested 10 pieces for an item but only 8 pieces are confirmed. SAP EWM reduces the delivery quantity to 8 pieces.

- Status value of the checked items as *Confirmed*

  In the detailed view of the item, choose the *Status* tab page.

- Quantities in the role for quantities *Availability Check*

  In the detailed view for the item, choose the *Additional Quantities* tab page. For example, you have requested 10 pieces of product A for a delivery item. However, only 8 pieces were confirmed. The *reduced quantity* is 8 pieces, the *open quantity* is zero, and the *requested quantity* is 8 pieces.

SAP EWM does not perform an availability check for the following delivery items:

- Delivery items that belong to a scrapping process
- Packing items

> Note:
> For more information, see the Implementation Guide (IMG) for EWM under *Interfaces* → *Availability Check* .

Scheduling

SAP EWM can set the following dates or times based on the results of the availability check:

- Dates or times at delivery header level:
  - Delivery date or time
- Dates or times at delivery item level:
  - Picking start and finish
  - Loading start and finish
  - Goods issue start and finish

SAP EWM only sets the picking or loading dates or times if you have specified them in the corresponding date profile in Customizing for the item type used.

SAP EWM performs the following scheduling based on the type of availability check it finds:

- If SAP EWM finds *Availability Check in SAP APO* , and you have defined scheduling in Customizing for SAP APO, SAP EWM copies the results of the scheduling into the direct outbound delivery order.

- If SAP EWM finds a different type of availability check, the system sets the dates or times of the direct outbound delivery order – such as the delivery date and goods issue start and finish – to the confirmation date of the availability check.

Control Messaging Dependent on Recipient

In the interface connections, you must define parameters for sending messages from SAP EWM to the SAP ERP system. You can execute the mapping optionally depending on the business system.

Control parameters for inbound deliveries are optional. If you do not make any entries here, the system uses the initial values.

- Control parameter for returning HU data

  If you want to avoid returning current HU data to the SAP ERP system during the goods receipt process, set the *Do Not Report HU Data in Goods Receipt Process* indicator.

Definition of parameters for outbound deliveries:

- Split Profile

  If the delivery split results in outbound deliveries in SAP ERP, you have to enter a split profile here. This split profile must already be defined in the SAP ERP system.

- Internal Number Range and Item Number Increment

  For manually created delivery documents in EWM or for documents resulting from a delivery split, the document number and the item numbers are assigned in EWM. This number range interval for the SAP ERP documents entered here must not overlap with the interval that you have defined in the SAP ERP system.

Hint:
The number range is also to be defined in Customizing in SAP EWM under *Extended Warehouse Management* → *Interfaces* → *ERP Integration* → *Delivery Processing* → *Define Number Ranges for ERP Documents*.

To Upload Account Assignment Data into EWM

If the direct delivery is for internal use and should be charged to a cost center, an internal order or a PSP element, this accounting data must be uploaded to EWM. The can be done manually, or it can be scheduled to run automatically.

Note:
One of the simplifications in SAP S/4HANA embedded EWM is that this step is not required.

1. To upload account assignment data select, on the EWM *Index* screen, choose *Extended Warehouse Management* → *ERP Integration* → *Administration of Account Assignment Data*.
2. To upload the cost center 1000 as it is used in this class, enter the following data:

Party Entitled to Dispose	**SPCW**

Acct Assignment Cat.	`10`
Account Assignment Obj.	`1000`

3. Verify that the control parameter *Create* is selected and that *Test Run* is not selected.
4. Choose *Execute* to upload the account assignment object.

Direct Outbound Deliveries Settings in SAP ERP

Because the outbound delivery is not created with the standard transactions in SAP ERP, the usual mechanism for the delivery type is not used. This has to be set up in the SAP EWM integration settings in SAP ERP.

Determination of the Delivery Type in SAP ERP for Direct Outbound Deliveries

For Customizing in the SAP ERP system, you define which delivery types are used for direct outbound deliveries. Before you can assign delivery types to direct outbound deliveries, you must first define suitable delivery types.

You can determine delivery types based on the following parameters:

- EWM delivery type

  This is used for the direct outbound delivery in SAP EWM. If you want to define the SAP ERP delivery type independently from the SAP EWM delivery type, enter `*` as a placeholder.

- Code for the initiator of a communication chain

  This code describes the business process in which direct outbound deliveries are submitted from SAP EWM to the SAP ERP system. If you want to define the delivery type independently of this code, enter `*` as a placeholder. Examples for business processes for direct outbound deliveries are:

  - KTS Kit-to-stock

    Direct outbound deliveries are used for posting goods issue for the kit components.

  - KTR Reverse kitting

    The disassembled kit headers are goods issue posted by means of direct outbound deliveries.

  - PIG Cash sales

    Goods are sold directly to customers within the warehouse.

  - DSH Direct shipment

    Goods are shipped to customers or other warehouses without prior planning.

- Warehouse number

  You can define the delivery-type settings for a specific warehouse number only. If you want to define the delivery type for all warehouses, enter `*` as a placeholder. If you make multiple entries with placeholders (`*`), the system first looks for the most specific matching entry. If you have defined multiple entries with the same number of placeholders, the system uses the matching entry with the most specific data fields on the left.

Determination of Item Categories in SAP ERP

There is also a table where you define the item categories that must be used for the items of the direct outbound delivery.

Usually, the SAP ERP item category is determined based on the delivery type, the item category group from the material, and the item usage (see standard item category determination). This additional Customizing activity provides the possibility to overrule the standard item category determination and to determine the item category dependent on the business processes for which direct outbound deliveries are used. Using the separate item category determination is optional. If you do not make any entries here, the standard item category determination is used.

Direct Outbound Deliveries Process

To create a direct outbound delivery, on the EWM *Index* screen, choose *Extended Warehouse Management* → *Delivery Processing* → *Outbound Delivery* → *Maintain Outbound Delivery Order* and then choose 🗋 (*Create*). Then, you can select in the pop-up the document type you need.

> ⚠ Caution:
> Initially, you will probably receive an error log prompting you to maintain a *Shipping office* and a *Party entitled to dispose* as default values.

Enter the required data, like the ship-to party, the items, quantities, and stock type so that the availability check can be completed.

When you save your direct outbound delivery, a message is sent to the SAP ERP system and the same outbound delivery is created here.

You perform the goods issue process steps, such as picking and packing, and finally you post the goods issue.

For direct outbound deliveries in the pickup scenario, there is a separate transaction, which can be found under *Extended Warehouse Management* → *Delivery Processing* → *Outbound Delivery* → *Pickup*. The follow-on functions are similar as for any other direct outbound delivery.

Invoice Before Goods Issue

It may be necessary to include the actual invoice in the shipment when it leaves the warehouse. For a direct outbound delivery, especially for a pickup process where you want the buyer to pay immediately, you might want to issue the invoice before you post the goods issue (which would normally trigger the invoice print). In this scenario, you can use the “invoice before goods issue” process to create and print the invoice before the goods issue is posted. You send an invoice request from SAP EWM to SAP CRM billing or SAP ERP billing.

You can request an invoice for each delivery, or one or more invoices for the contents of a vehicle or transportation unit.

- If you want to print invoices for the contents of a vehicle or transportation unit, SAP EWM triggers the invoice printout in SAP CRM billing or SAP ERP billing by sending the message *Print Billing Document*.
- If you want to create one invoice for each delivery, SAP EWM triggers the creation and invoice printing automatically when it generates an outbound delivery.

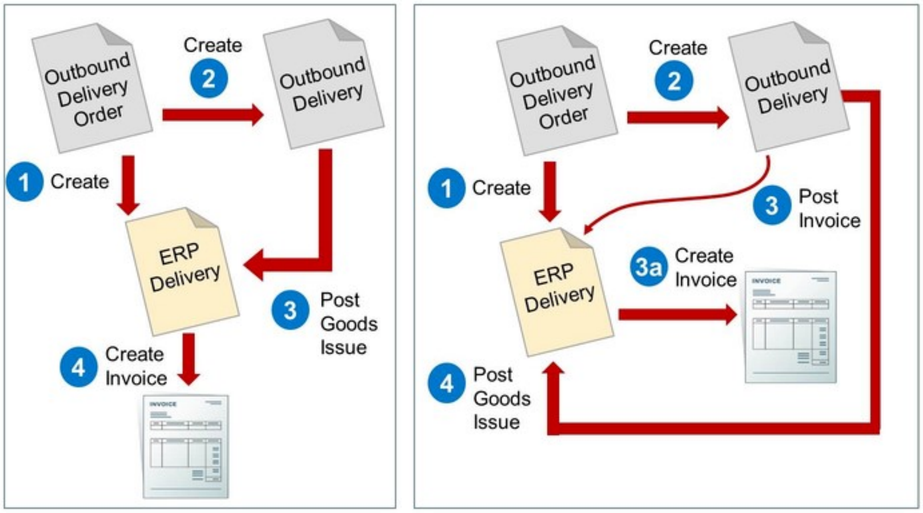


Figure 20: Invoice Before Goods Issue

Single Requests and Group Requests

For single requests, SAP CRM billing or SAP ERP billing directly creates single invoices that you cannot change. To make changes, you must delete the outbound delivery. This automatically cancels the invoice. If you generate a new outbound delivery, the invoice is automatically created and printed again.

For group requests, SAP CRM billing or SAP ERP billing creates one or more invoices for each vehicle or transportation unit. SAP CRM billing creates corresponding billing due list items. You can make changes to these deliveries in SAP EWM. If these occur before invoice creation, SAP ERP or SAP CRM updates its deliveries or the invoice-relevant data in accordance with the input from SAP EWM.

After you have posted the goods issue, you can only trigger the invoice printout from SAP CRM billing or SAP ERP billing.

If more than one vehicle forwards the material for a sales order, you can create related outbound deliveries for each vehicle and request invoices for them.

You can determine a print profile after SAP CRM billing or SAP ERP billing has selected the printer. SAP EWM finds the print profile and informs CRM billing or ERP billing accordingly. For printing single requests, the billing system uses the print profile found. For the printing of group requests, the billing system uses the profile of the first delivery found.

LESSON SUMMARY

You should now be able to:

- Define the settings for direct outbound deliveries in SAP EWM
- Execute the outbound delivery process

Unit 2

Learning Assessment

1. How do you perform VAS with process-oriented storage control?

   Arrange these steps into the correct sequence.

   ☐ The system creates a VAS order based on the inbound delivery or the outbound delivery order.

   ☐ After completing all value-added services, the products reach the goods issue area or the final storage bin.

   ☐ The system then creates warehouse tasks that contain a work center as the destination storage location in accordance with the VAS order.

   ☐ For each item, the system determines the corresponding packaging specification.

2. In planned cross-docking, you work with standard inbound and outbound deliveries and start the standard goods receipt process or goods issue process.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

3. Under what circumstances can you use direct outbound delivery orders?

   Choose the correct answers.

   ☐ A Pickup

   ☐ B Kit to order

   ☐ C Kit to stock or reverse kitting

   ☐ D Scrapping

   ☐ E Immediate deliveries

4. What data is entered in order to perform the availability check?

   Choose the correct answers.

   ☐ A Ship-to party

   ☐ B Item

   ☐ C Quantity

   ☐ D User ID

   ☐ E Stock type

Unit 2

Learning Assessment - Answers

1. How do you perform VAS with process-oriented storage control?

   Arrange these steps into the correct sequence.

   2 The system creates a VAS order based on the inbound delivery or the outbound delivery order.

   4 After completing all value-added services, the products reach the goods issue area or the final storage bin.

   3 The system then creates warehouse tasks that contain a work center as the destination storage location in accordance with the VAS order.

   1 For each item, the system determines the corresponding packaging specification.

2. In planned cross-docking, you work with standard inbound and outbound deliveries and start the standard goods receipt process or goods issue process.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

   That is correct. In planned cross-docking, you define in Customizing how the cross-docking process is to proceed.

3. Under what circumstances can you use direct outbound delivery orders?

   Choose the correct answers.

   ☒ A Pickup

   ☐ B Kit to order

   ☒ C Kit to stock or reverse kitting

   ☒ D Scrapping

   ☒ E Immediate deliveries

4. What data is entered in order to perform the availability check?

Choose the correct answers.

☒ A Ship-to party

☒ B Item

☒ C Quantity

☐ D User ID

☒ E Stock type

UNIT 3

Work with Packed Materials

Lesson 1

Using Stock-specific Unit of Measure 41

Lesson 2

Planning Cartonization 48

Lesson 3

Creating Items for Packaging Materials 53

UNIT OBJECTIVES

- Use stock-specific unit of measure
- Plan cartonization
- Create items for packaging materials

Unit 3
Lesson 1

Using Stock-specific Unit of Measure

LESSON OVERVIEW

In this lesson, you learn about alternative units of measure, and the effects on master data. You also learn about stock-specific units of measure.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use stock-specific unit of measure

Alternative Unit of Measure

Often, material has not just one unit of measure, but several alternative units of measure. Alternative units of measure could, for example, describe that 10 pieces of a material are in one box, or that 100 pieces of a material are on one pallet.

Sometimes the alternative units of measure are used to reflect how the stock is physically handled in the warehouse, for example, for wine, a bottle might be the base unit of measure, but it might be more practical to handle it as a case of six bottles.

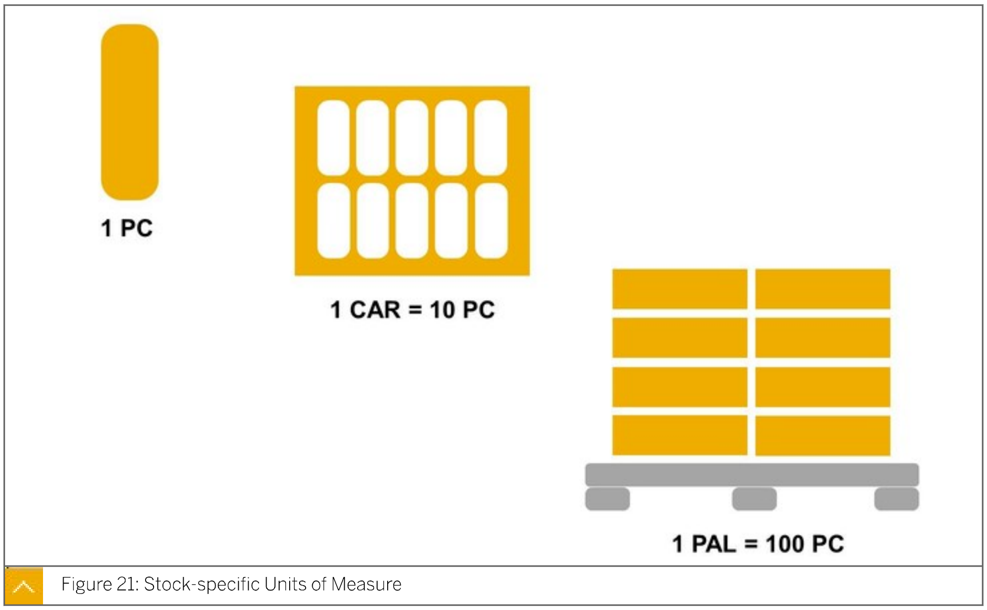


Figure 21: Stock-specific Units of Measure

The stock-specific unit of measure (SUom) is an alternative to the base unit of measure that is available in the background in the stock data, and in logistic-relevant documents, such as inbound and outbound deliveries and warehouse tasks. This unit of measure covers the data capturing during the inbound process, and the use of it in the internal and outbound process. In the outbound process, the ERP outbound delivery can be updated with the physically picked unit of measure based on the stock-specific unit of measure. It is deployable to the customer through a delivery note, or an invoice, or both, so that the documents reflect the physical goods.

Effects on Master Data

If you use the stock-specific unit of measure functionality in SAP Extended Warehouse Management (EWM), the alternative unit of measure of your stock gets an important stock attribute, because it reflects the physical packaging of your products. If you change the unit of measure quantity conversion factors in the product master, it affects this attribute.

Table 1: Units of Measure

	Alternative Unit			Base Unit
1	PC	converts to	1	PC
1	CAR	converts to	10	PC
1	PAL	converts to	100	PC

Preferred Unit of Measure

The preferred unit of measure is the packaging size in which you usually store a product in your warehouse. You can maintain the preferred unit of measure for the product at a global level (this is usually maintained in ERP) and at the warehouse level. The system uses the global preferred unit of measure in warehouse processes unless you maintain a warehouse-specific unit of measure.

You can adopt the global preferred unit of measure from the ERP system. To do this, you must implement a CIF enhancement in ERP. In the enhancement implementation you can choose one of the material's existing units of measure. This reduces maintenance effort in the material master.

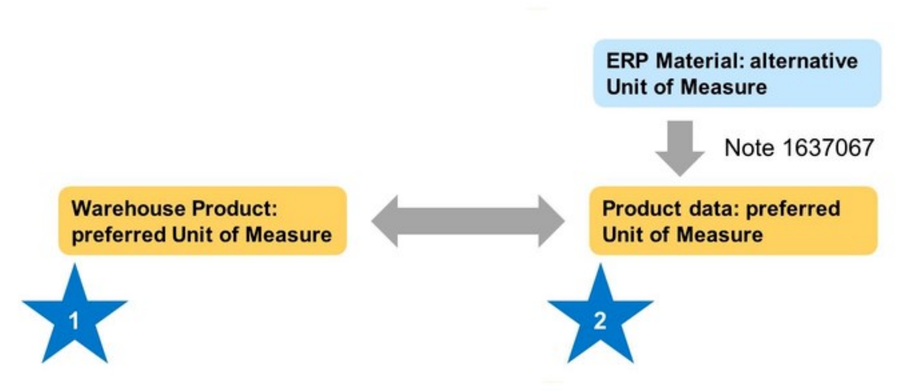

ERP Material: alternative Unit of Measure
Note 1637067
Warehouse Product: preferred Unit of Measure
Product data: preferred Unit of Measure
1
2

Figure 22: Preferred Units of Measure

The preferred unit of measure is used as a proposal in the following warehouse processes:

- Inbound processing
- Stock removal rules
- Cartonization planning

The preferred unit of measure is used in inbound delivery processing and cartonization planning to propose a unit of measure to simplify the process. You can use stock removal rules to pick stock that is not in the preferred unit of measure first, to clean up stock regarding the unit of measure, or you can pick stock that is actually in the preferred unit of measure first.

You can use the Business Add-In (BAdI) Determination of Unit of Measure for Warehouse Operations to dynamically change the preferred unit of measure that is used in warehouse processes. You can find this BAdI in Customizing for Extended Warehouse Management under *Business Add-Ins (BAdIs) for Extended Warehouse Management → Master Data → Product*.

You can also use the warehouse management monitor node *Stock Not In Pref. UoM* to identify stock that is not in the preferred unit of measure. In the standard SAP monitor structure, you can find this node under *Stock and Bin*.

Stock-specific Units of Measure in Inbound Processes

There are two possible scenarios in which the stock-specific unit of measure can be used in the inbound delivery process:

1. The purchase order and inbound delivery in ERP are entered using the stock-specific unit of measure. The stock-specific unit of measure is set by the vendor in the advanced shipping notification. After replication, the inbound delivery uses the stock-specific unit of measure.
2. The purchase order and inbound delivery are base units of measure in ERP and the stock-specific unit of measure is set in EWM. It can be set automatically if a preferred unit of measure is specified in the product master, or it can be modified manually.

You can also enter or change the alternative unit of measure during the inbound process at the following points:

- Before goods receipt
- During expected goods receipt and receipt of handling units
- During packing or deconsolidation
- During putaway confirmation

Preferred Unit of Measure in Inbound Delivery

When creating inbound deliveries in SAP EWM, the system can propose the preferred unit of measure automatically. If the products are usually delivered in the preferred unit of measure, but the inbound delivery is only created in the base unit of measure, proposing the preferred unit of measure can speed up the inbound process, because the unit of measure does not have to be set manually for every delivery item. As a prerequisite, you enable the proposal of the preferred unit of measure in the inbound process by selecting the *Apply ERP AUoM as SUoM* checkbox for the delivery item type.

There are a number of different scenarios in which the preferred unit of measure is used in inbound delivery processes:

- The inbound delivery is created in the ERP system and sent to EWM. The system attempts to propose the preferred unit of measure for each delivery item during the transition from inbound delivery notification to inbound delivery. The inbound delivery notification keeps the unit of measure that was originally sent from ERP. The system does not propose the preferred unit of measure in every case, but only if the quantity of the delivery item can be evenly converted from the base unit of measure into the preferred unit of measure without a remainder. Otherwise, the assumption is that the quantity is actually in a different unit of measure than the preferred unit of measure.

The system also checks whether the quantity of the delivery item is in the base unit of measure. If the delivery item of the ERP delivery already has an alternative unit of measure, it is assumed that this unit of measure was chosen on purpose and, therefore, it is not overwritten with the preferred unit of measure.

- The inbound delivery is created from an expected goods receipt. In this case, the preferred unit of measure is proposed when creating an inbound delivery item from an expected goods receipt item. The same rules as in the first case apply.
- The inbound delivery is created in EWM without a corresponding ERP document. Because there is no preceding document, the unit of measure is proposed on the user interface if the user has not already entered one, regardless of the quantity entered.

Stock-specific Unit of Measure During Packing in an Inbound Process

During inbound packing, you can overwrite the quantities and units of measure of planned handling unit items before goods receipt, when the received handling unit content differs from the planned one. If you check the quantities and units of measure of received handling units before goods receipt, you should use this function. You can make an entry in the unit of measure field when the delivery item indicated by the planned handling unit item is stock-specific unit of measure relevant.

> Note:
> For catch weight materials, the function is not supported and the unit of measure field remains read-only.

You can repack the contents of a handling unit during inbound packing. This can be necessary if, for example, you check the handling unit contents and find that the handling unit is packed differently to the way in which the system assumes it is packed. If a product has a stock-specific unit of measure, you can change the alternative unit of measure during packing.

The following example describes the use of the alternative unit of measure:

A warehouse worker at an inbound packing station receives a handling unit that includes products that are stock-specific. According to the system, the handling unit contains three cartons of six (C06) of product A, but the handling unit actually contains three cartons of eight (C08). The warehouse worker changes the quantity in the system to 3 C08.

If a warehouse worker changes the alternative unit of measure of a product, it is likely that the actual quantity also deviates from what is represented in the system.

If the quantity is smaller than what the system expects, the remaining quantity is kept in the original handling unit. Alternatively, you can use an exception code to make the system post the remaining quantity as a difference automatically.

If the actual quantity exceeds the quantity expected by the system, you must use an exception code to increase the quantity of the related delivery item. The exception code can be drawn automatically, so the user does not have to enter it every time such a difference occurs. To do so, you have to assign an exception code to suitably increase the quantity of the inbound delivery item to the internal exception alternative unit of measure. However, if an exception code is specified by the user, it is not overridden by the system.

The exception code that is assigned to the internal exception alternative unit of measure must be defined for the business context PPT — Packing/Unpacking Products (Putaway), and for the execution step A0 — Data Verification in Background. The internal process code of this exception must be DIFF — Post with Difference with a difference category of Difference As Charges for Inbound Delivery, and a corresponding process code to adjust the delivery quantity.

If the user enters an EAN in the product field on the *Repack Product* tab and this EAN is assigned to a stock-specific unit of measure, this stock-specific unit of measure is displayed on the UI.

Alternative Unit of Measure During Putaway

The system takes the alternative unit of measure of the available quantity when creating a warehouse task (WT). The available quantity is created during goods receipt posting, based on the inbound delivery item. If the inbound delivery item is packed in a handling unit, the system takes the alternative unit of measure from the stock in this handling unit. Therefore, in some cases, the alternative unit of measure packed in the handling unit can differ from the alternative unit of measure of the inbound delivery item.

You can change the alternative unit of measure of a warehouse task while confirming the warehouse task in putaway. If the alternative unit of measure is stock-specific, this alternative unit of measure is stored in the quant. Otherwise the alternative unit of measure of the source quant is used as the alternative unit of measure of the destination quant. You can also change this alternative unit of measure with the BAdI *Changing Quant Attributes During WT Confirmation*, which you can find in Customizing for Extended Warehouse Management under *Business Add-Ins (BAdIs) for Extended Warehouse Management* → *Cross-Process Settings* → *Warehouse Task* → *Confirmation of Warehouse Task*.

You can use confirmation correction to correct the confirmed putaway quantity, but you cannot change the alternative unit of measure here.

Stock-specific Units of Measure in Outbound Processes

You can use stock-specific unit of measure functionality in outbound processes in a variety of ways, including picking and outbound delivery.

If you use the stock-specific unit of measure functionality, the following features are enabled in the outbound delivery process:

- The system can handle multiple stock-specific units of measure for each delivery item.
- When a customer orders a quantity, the system can decide what picks to perform to fulfill the order.
- The system can decide which stock should be picked, and what unit of measure it should be picked in, to fulfill an order. For example, the stock removal strategy could be to first pick the stock that is not in the preferred unit of measure.
- The system always displays the alternative unit of measure on the user interface to enable picking and pack processes to reflect physical reality.
- You can send packing and unit of measure data to the customer. An overview of which stock-specific units of measure are shipped is shown in the hierarchy type unit of measure.
- You can update the outbound delivery in ERP with stock-specific unit of measure data to reflect physical reality.

Normally, the outbound delivery item is created in SAP ERP in the base unit of measure and sent to SAP Extended Warehouse Management (EWM). It is transferred unchanged to the EWM outbound delivery request (ODR) and outbound delivery order (ODO). The WT is also created and confirmed in the base unit of measure. The following scenarios are possible if you are using stock-specific unit of measure functionality:

- The outbound delivery item is created in ERP in the base unit of measure and sent to EWM. It is transferred to the EWM ODR and ODO unchanged. The WT is created and confirmed using a stock-specific unit of measure.
- The outbound delivery is created in ERP in an alternative (not base) UoM and sent to EWM. If this AUoM is maintained as stock-specific in EWM, it is transferred to the EWM ODR and ODO as the UoM of the item. If an alternative unit of measure is sent from ERP to EWM, it is not used to find a stock that is exactly in this unit of measure, but the search strategy for picking is relevant.
- The outbound delivery is created in ERP in an alternative (not base) unit of measure and sent to EWM. If this unit of measure is not maintained as stock-specific in EWM, it is transferred to the EWM ODR and ODO as the additional quantity role Sales Quantity.

The final outbound delivery is always created using the same UoM as the corresponding outbound delivery order item.

In contrast to the inbound delivery process, the preferred unit of measure from the product master is not used by default in any outbound delivery documents.

If you have selected the *Update Delivery Item SUoM* checkbox in Customizing for the outbound delivery item type, confirming a warehouse task for picking can change the unit of measure of the outbound delivery order item. If stock is picked using a stock-specific unit of measure, item unit of measure is updated accordingly. If this checkbox is not selected, picking does not change the EWM delivery order item unit of measure.

In addition, if you have selected the *Update Delivery Item SUoM* checkbox, and stock for one outbound delivery order item is picked using multiple SUoMs, the system creates new subitems with the hierarchy type unit of measure.

If the outbound delivery order item unit of measure is changed in EWM as described above, it is communicated back to the ERP outbound delivery item at the point of goods issue, if the *Update Delivery Item SUoM* checkbox is selected. Because goods issue can be carried out based either on the ODO or on the final outbound delivery, SAP recommends that you select this checkbox for the item type with the document categories PDO and FDO.

Alternative Unit of Measure During Picking

When picking, the alternative unit of measure of the outbound delivery order item has no influence on the WT, so the system does not prioritize looking for stock that has the same alternative unit of measure as the outbound delivery item. You can use a stock removal strategy to pick stock that is not in the preferred alternative unit of measure first.

> Note:
> If you want the stock removal strategy to take the alternative unit of measure of the outbound delivery order item into account, you must use the Business Add-In (BAdI) Filtering and/or Sorting of Quants, which you can find in Customizing for Extended Warehouse Management under *Business Add-Ins (BAdIs) for Extended Warehouse Management* → *Goods Issue Process* → *Strategies* → *Stock Removal Strategies*. You can set up a custom implementation for this BAdI to filter and sort quants with respect to the outbound delivery order item's unit of measure.

LESSON SUMMARY

You should now be able to:

- Use stock-specific unit of measure

Unit 3
Lesson 2

Planning Cartonization

LESSON OVERVIEW

In this lesson you learn about cartonization planning. You learn about the process and algorithm profiles. You also learn about shipping handling units.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Plan cartonization

Cartonization Planning

Cartonization planning is used to optimize the packing of shipping handling units (HUs) based on information from product master data and outbound delivery orders. Cartonization planning results in the creation of planned shipping handling units (PSHUs) that can be used as templates for creating shipping HUs during picking or packing.

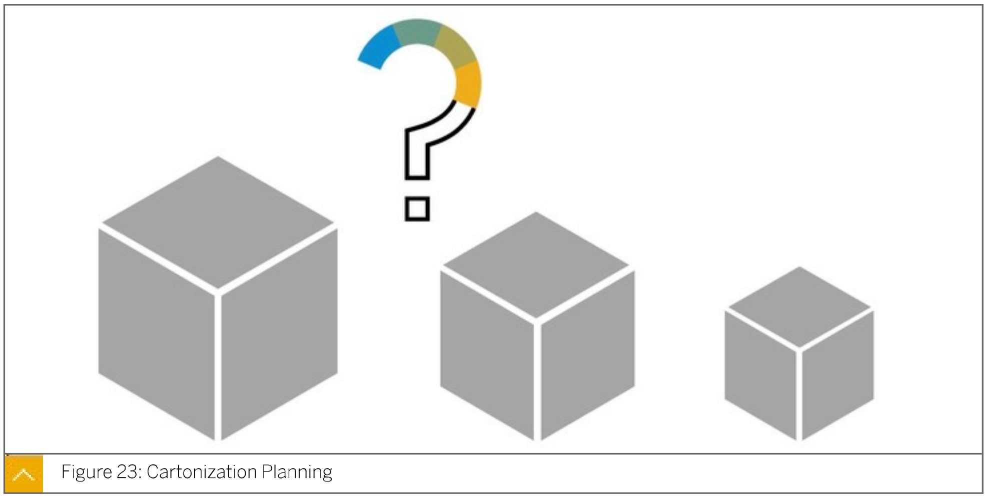


Figure 23: Cartonization Planning

Performing cartonization planning supports two primary goals:

- Selection and combination of the right packaging materials to minimize empty space (which means reducing shipping costs) and the reduction of product damage during transportation due to fewer under-utilized HUs.
- Make information available early in the execution process about shipping containers that may be used to optimize other processes.

A PSHU is an object similar to a shipping HU, describing a packaging material and the items that it contains. In contrast to a shipping HU, a PSHU does not physically exist in the warehouse and is only used to plan shipping HUs. You can create PSHUs manually or automatically in cartonization planning. You can create nested PSHUs for cartonization planning of deliveries where HUs are packed into larger HUs.

Automatic cartonization planning uses algorithms to create PSHUs. Algorithms are defined as implementations of the BAdI: Cartonization Planning Algorithm. The default implementation aims at minimizing the number of HUs. The default algorithm uses a heuristic approach, but the result is no optimization.

A manual cartonization planning or the changing of an automatically created cartonization plan is also possible.

Process Profile

The cartonization planning process profile defines the point when the planned shipping HUs are created, and the creation point when the planned shipping HUs are used to build shipping HUs.

Planned shipping HUs can be created automatically for outbound delivery orders, for waves, or during the warehouse order creation. Additionally, you can also repack, unpack, or delete PSHUs manually.

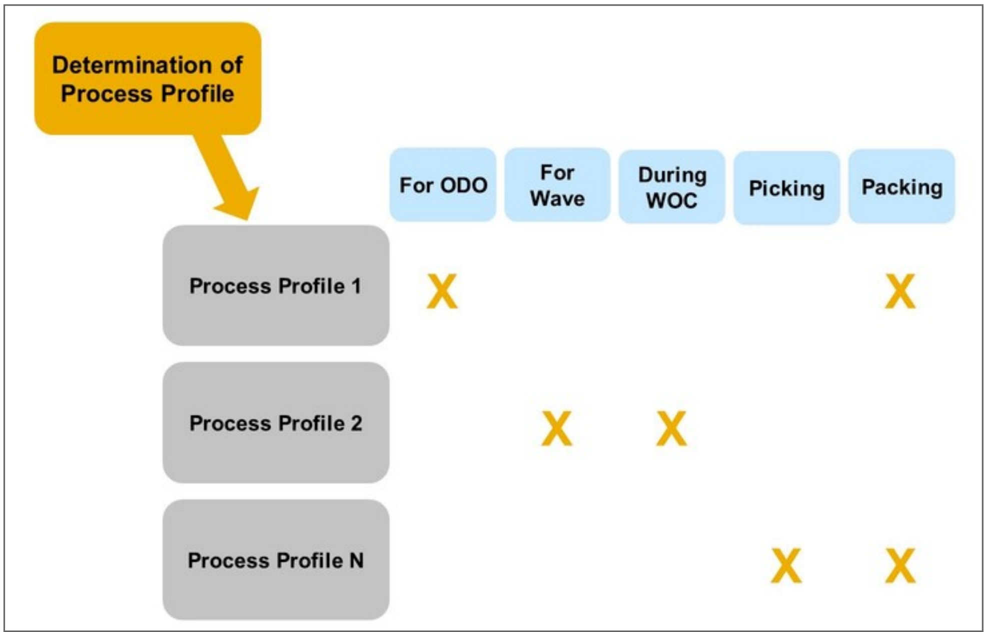


Figure 24: Process Profile

PSHUs can then be used as templates for the creation of the shipping HU during picking or during packaging in a work center, or using radio frequency (RF), depending on the process profile.

Algorithm Profile

The algorithm profile defines the way the system creates planned shipping HUs. An algorithm contains the properties that are used for cartonization planning.

The SAP standard algorithm SAP1 minimizes the number of HUs by checking the volume and optionally the dimensions (see the predefined properties in the following list). This is the default implementation of the BAdI Cartonization Planning Algorithm.

Note:
The following predefined properties can be maintained in the algorithm profile. If they are sufficient, no other properties need to be maintained.

- Split Delivery Item

  The quantity of an outbound delivery item can be split if it does not fit completely into one PSHU.

- Dimension Check

  The cartonization planning checks the dimensions (length, weight, and height) of outbound delivery items against the packaging materials for the creation of the PSHUs.

- Filling Level

  The maximum level (in percent) up to which the packing material should be filled.

- Iteration Limit

  Controls how many iterations the algorithm carries out to find further approximations to a solution. This means that the iteration limit affects the runtime and the quality of the solution.

Since SAP EWM9.5, the algorithm SAP2, SAP SCM Basis Package Builder Algorithm, is available with the BAdI implementation /SCWM/EI_CAP_PB_TM. This is the same algorithm that SAP Transportation Management uses to create freight units. This algorithm does not replace the existing cartonization algorithm, but it provides more features. The package building algorithm works as follows:

- The system first tries to create full pallets of a single product.
- If a quantity remains, the system creates mixed pallets where each layer consists of a single product.
- If the system cannot create layers of one product, it creates mixed layers.
- The system takes into account the weight, height, and volume of the products.

The details are defined in the *Package Building Profile* .

A customer can define their own, optimized algorithm by their own implementation of the BAdI Cartonization Planning Algorithm.

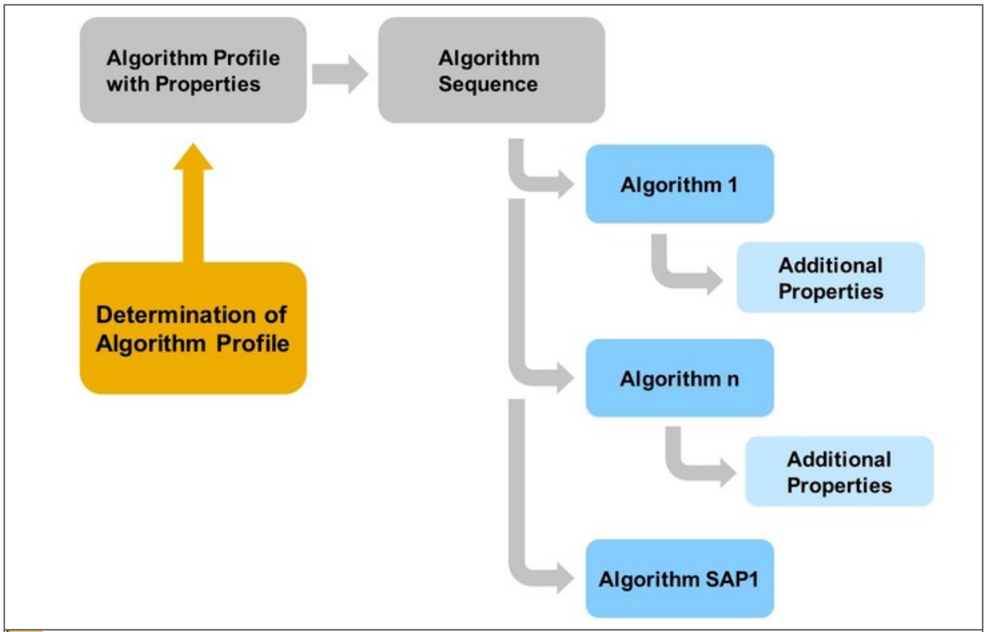


Figure 25: Algorithm Profile

The algorithm profile is assigned to an algorithm sequence. This algorithm sequence lists the different algorithms to be used. The algorithm profile is determined using various fields, such as warehouse process type, activity area, and others. The fields to be used are set up in an access sequence. The determination table is maintained under *Extended Warehouse Management → Settings → Determine CAP Algorithm Profiles* .

Monitoring of PSHUs

You can monitor the created planned shipping handling units in the warehouse management monitor in the monitor node PSHU. You have several selection criteria, for example:

- Document, wave, or both
- Partner
- Shipment
- Route

For each selected PSHU, the monitor displays the relevant header data. Additionally, the monitor displays the relevant data of delivery items packed into the selected PSHU. If a value is not unique, for example, different TUs are assigned, the monitor displays the value `***`.

The SAP standard layout Planned Shipping HU Aggregation (0/PSHU_AGGR) displays the following:

- Summary of the gross weight and volume per HU type and carrier
- Summary of the overall gross weight and volume

Note:
By default, the layout variant is not visible. To use the layout variant, select it or set it as the default.

Deletion of PSHU

You can delete obsolete PSHUs using the transaction `DELETE PLANNED SHIPPING HANDLING UNITS`.

Using this transaction, you can only delete a PSHU if all of its related outbound delivery order items fulfill the selection criteria. If you want to delete a PSHU that contains delivery items that do not fulfill your selection criteria, you have to use the transaction `CARTONIZATION PLANNING FOR OUTBOUND DELIVERY ORDERS` or `CARTONIZATION PLANNING FOR WAVES` in execution mode Deletion of PSHUs. These transactions also offer further criteria to select PSHUs for deletion.

Note:
SAP recommends that you delete obsolete PSHUs regularly.

LESSON SUMMARY

You should now be able to:

- Plan cartonization

Unit 3
Lesson 3

Creating Items for Packaging Materials

LESSON OVERVIEW

In this lesson you learn about the automatic generation of packaging items.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create items for packaging materials

Automatic Generation of Packaging Items

Some packaging materials like pallets, containers, or cartons are very costly and should not be just given away. Certain packaging materials might be sold to customers; for others you want to keep track of the stock, so you can retrieve them later. To do this, it is necessary to create items for the materials used for packaging.

Figure 26: Packaging Materials

Using automatically generated packaging items allows you to process outbound deliveries without having to create packaging items manually for deliveries where handling units (HUs) are used. Based on the configuration, the system can create packaging items from the packaging products of the HU and the auxiliary packaging products inside the HU.

During the creation of the outbound delivery, SAP EWM automatically creates packaging items. These are based on HU packing information. In the configuration, you define which packaging materials and deliveries are relevant for the generation. It is a fully automated process – the goods issues posting is automatically done together with the outbound delivery. In case of the deletion of an outbound delivery in SAP EWM, such created packaging items are automatically deleted as well.

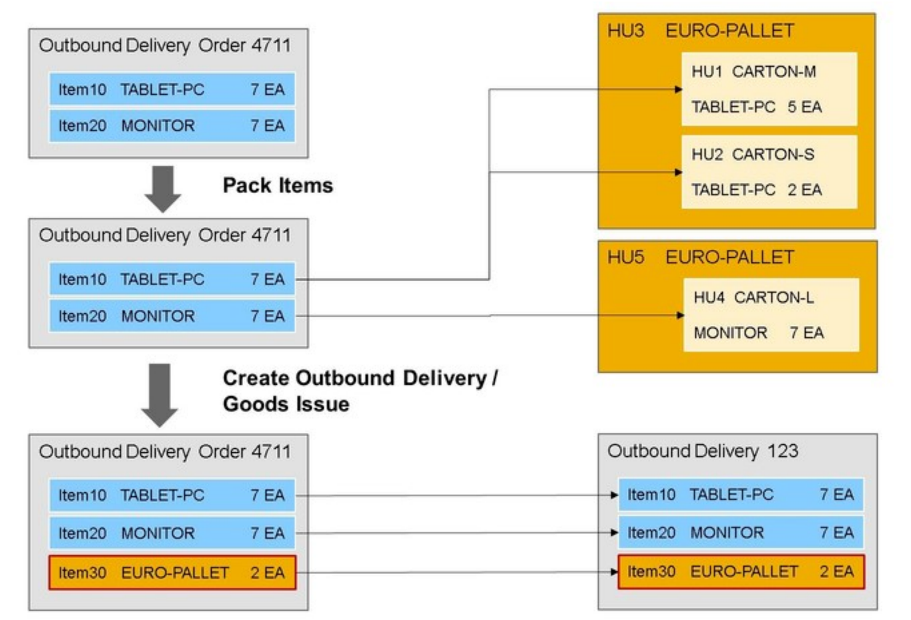


Figure 27: Automatic Generation of Packaging Items

Automatic Generation Versus Manually-created Items

Before the solution for the automatic generation of items for packaging materials was available, it was already possible to create items for packaging materials manually. But there are some clear differences in setup and handling between these two possibilities.

Table 2: Automatic Generation Versus Manually-created Items

The following table gives an overview of the differences (all based on the standard settings):

Settings	Generated Packaging Items for HU	Standard Packaging Items
Item Type	OPHU	OPAC
Picking Required	No	Yes
Loading Required	No	Yes
Creation	Automatic (using HU)	Manual
Manual Creation	Not allowed	Allowed
TU Assignment	Automatic (using outbound delivery)	Manual
Goods Issue	Automatic (using outbound delivery)	Manual

Settings for Automatic Generation of Packaging Items

The activation of the automatic generation of packaging items is set for a combination of a warehouse number and a delivery type. Additionally, the packaging material type, for which the generation should happen must be selected.

> Note:
> The activation is not based on the packaging material or product master, but on the packaging material type (which is a field in the product). That means that if you have, for example, different cartons, and for some you want to create items and for others you do not, you must have different packaging material types for the differentiation.

Additionally, there a several BAdIs available. They all belong to the enhancement spot / SCWM/ES_DLV_PACK_ITEM.

- /SCWM/EX_DLV_PACI_REL_TYPE (Relevance for Generation of Packaging Items): You can use this BAdI to specify whether an outbound delivery order is relevant for the automatic generation of packaging items or not.
- /SCWM/EX_DLV_PACI_REL_PMTYP (Packaging Material Type for Packaging Item Generation): You can use this BAdI to specify whether you want to generate packaging items for your HU or not. This BAdI is called after the BAdI Relevance for Generation of Packaging Items.
- /SCWM/EX_DLV_PACI_DET_ITYP (Delivery Type for Generated Packaging Item): You can use this BAdI to decide which item type the system uses when it generates packaging items for HUs. You must choose a packaging item type that is not relevant for picking.
- /SCWM/EX_DLV_PACI_ITEM_MOD (Modification of Data for Generated Packaging Items): You can use this BAdI to change the list of packaging products and their quantities before the system generates packaging items, as follows:
  - Add items
  - Remove items
  - Change the quantity
  - Set values for your customer extension fields
- SCWM/EX_CORE_CR_ABORT can be used to avoid repacking after outbound delivery creation.

LESSON SUMMARY

You should now be able to:

- Create items for packaging materials

Unit 3

Learning Assessment

1. For an inbound process the preferred unit of measure can be proposed by SAP EWM.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

2. Cartonization planning can happen for which of the following processes or document?

   Choose the correct answers.

   ☐ A Outbound delivery orders

   ☐ B During picking

   ☐ C During putaway

   ☐ D During packing

3. You can control for which HU an item for the packaging material is created.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

Unit 3

Learning Assessment - Answers

1. For an inbound process the preferred unit of measure can be proposed by SAP EWM.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

2. Cartonization planning can happen for which of the following processes or document?

   Choose the correct answers.

   ☒ A Outbound delivery orders

   ☒ B During picking

   ☐ C During putaway

   ☒ D During packing

3. You can control for which HU an item for the packaging material is created.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

UNIT 4

Expansion of a Warehouse

Lesson 1

Managing Shipping and Receiving 59

Lesson 2

Setting Up the Determination of Staging Areas, Doors, and Routes 72

Lesson 3

Planning Transportation 77

UNIT OBJECTIVES

- Set up yard management
- Perform yard movements
- Schedule a dock appointment
- Plan shipping activities with the shipping cockpit
- Set up the determination of staging areas, doors and routes.
- Plan transportation
- Integrate SAP ERP Transportation Planning with SAP EWM
- Integrate SAP Transportation Management (TM) with SAP EWM

Unit 4
Lesson 1

Managing Shipping and Receiving

LESSON OVERVIEW

In this lesson, you llearn about how to set up yard management. This lesson also describes the various yard movements and dock appointment scheduling.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up yard management
- Perform yard movements
- Schedule a dock appointment
- Plan shipping activities with the shipping cockpit

Shipping and Receiving

The shipping and receiving part of SAP Extended Warehouse Management (EWM) comprises the following areas:

- Usage of vehicle and transportation units for managing the transportation to or from your warehouse
- Loading and unloading, including docking at or undocking from a door
- Yard management

Shipping and receiving can be integrated with transportation planning tools available in SAP ERP or SAP TM.

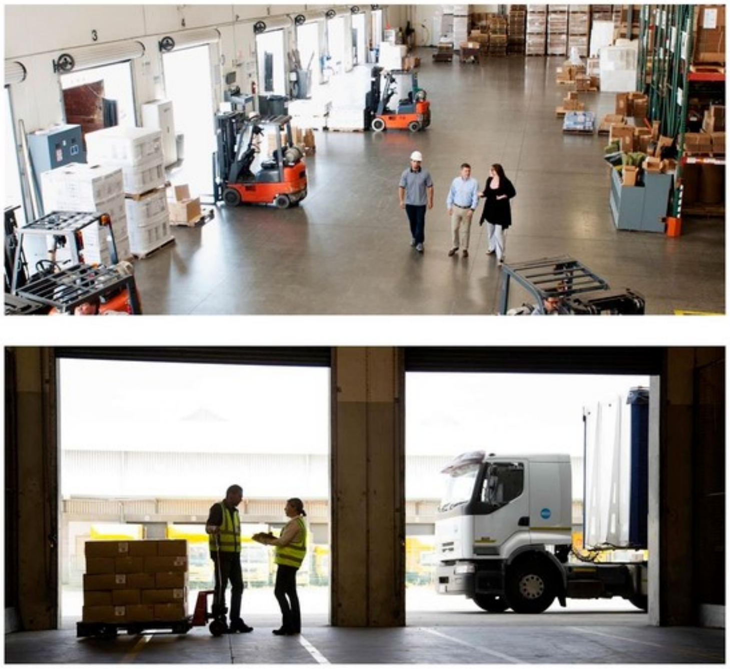


Figure 28: Shipping and Receiving

Yard Management

The yard is an enclosed area outside a warehouse where vehicles and transportation units are dealt with, waiting to be dealt with, or waiting to be collected by an external carrier. You can use a yard with basic functions to control the arrival, loading or unloading, and leaving of trucks. More advanced functions can be used to control the individual movements of trucks. This is called yard management.

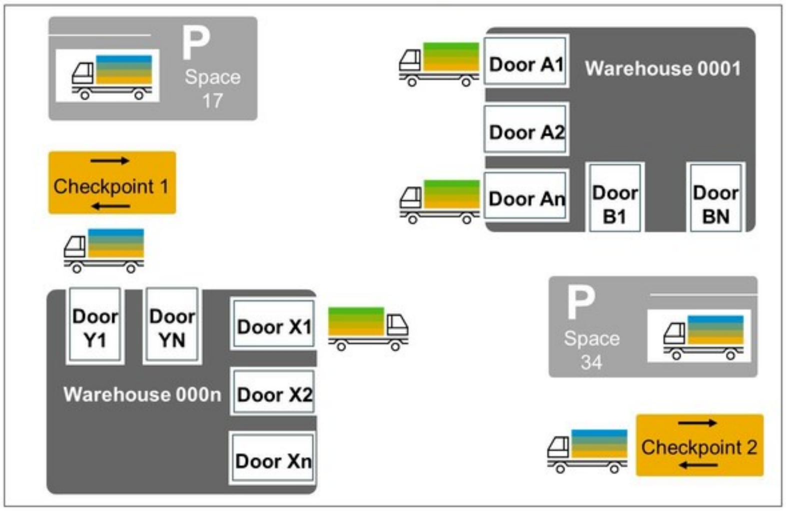


Figure 29: Yard Management

Yard Management Setup

A yard represents a separate storage type in a warehouse. However, you can also configure it with a separate warehouse number, which must then include a storage type that has the role *Yard* . In both cases, you can use one yard for multiple warehouses. Conversely, you can define a warehouse with multiple yards.

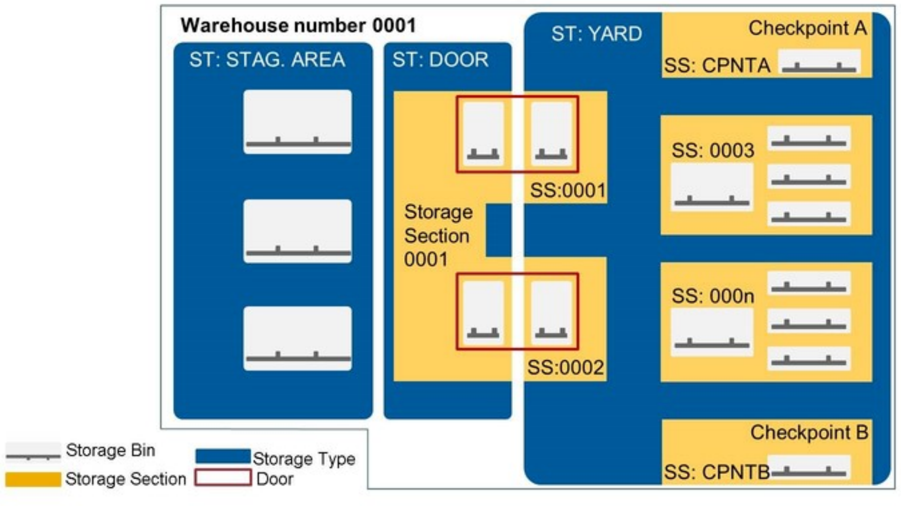


Figure 30: Yard Setup

Yard Structure

You map the corresponding storage bins as yard bins, which you can group into yard sections, in the same way as for the warehouse. The following structures are possible in a yard:

- Parking spaces

  A parking space is a position in the yard where a vehicle or transportation unit (TU) is parked. You can combine multiple parking spaces to form a parking section. You define parking spaces as standard storage bins with standard storage sections and standard storage bin types with the role *Yard* .

- Checkpoints

  A checkpoint is a location where vehicles and TUs enter or exit the yard. This can represent a physical gate at the yard entrance, or a virtual gate from which data is transmitted electronically. You define checkpoints in Customizing. You must then assign each checkpoint to a yard bin. This assignment must be unique, meaning you cannot assign two checkpoints to the same yard bin. You can also assign each checkpoint to a supply chain (SC) unit.

- Doors

  A door is a location in the warehouse where the goods arrive at or leave the warehouse. The door is an organizational unit that you assign to the warehouse number. It connects the yard to the warehouse. Vehicles and their TUs drive up to the doors of a warehouse to load or unload goods there. The doors are in close proximity to the relevant staging areas – you make an assignment between staging areas and doors.

You then assign each door to a storage bin that you can use to post goods receipts or goods issues. You create these storage bins in a storage type with the storage type role *F*.

You can also assign doors to supply chain units to control authorization checks. You also assign doors to yard bins – this is then the connection to the yard.

A simple yard without yard management has no parking spaces and no bins for doors in the yard.

Vehicles and Transportation Units

In the yard, you move vehicles or transportation units.

A vehicle is a specialization of a particular means of transport. A vehicle can comprise one or more transportation units and represents the physical entity of the transport vehicle.

A transportation unit is the smallest unit of a vehicle that can be loaded to transport goods. The TU can be a fixed part of the vehicle. The following figure shows different TUs.

- Vehicle 1: Semitrailer truck, which equals one TU
- Vehicle 2: Truck with cargo area and trailer, which equals two TUs
- Vehicle 3: Train with four wagons, which equals four TUs

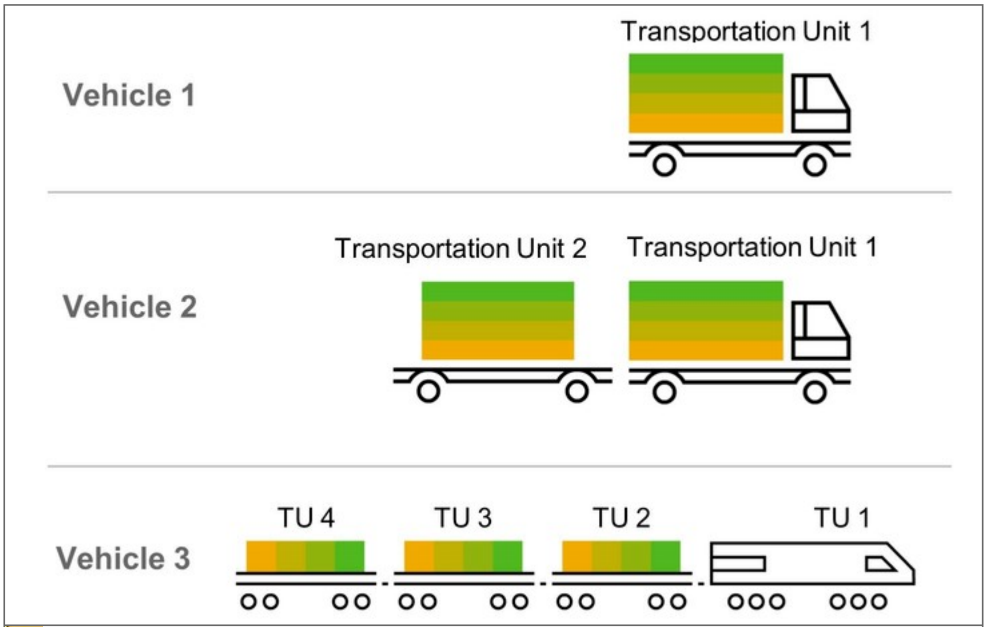


Figure 31: Vehicles and Transportation Units

Creation of Transportation Units and Vehicles

It is not mandatory to use vehicles in shipping and receiving, if the features available at the transportation unit level are sufficient for your transportation unit processes.

You can create vehicle and transportation units separately and assign one to the other. You can also combine a means of transport with one or more packaging materials, and create the vehicle automatically through the manual creation of a transportation unit or vice versa.

In shipping and receiving, there are several ways to create transportation units or vehicles, or both, as follows:

- They can be created manually through the transactions in EWM.
- They can be created automatically through receiving the information as part of the inbound or outbound delivery from ERP.
- You can use the Shipping Cockpit for outbound planning for the creation of transportation units and assignment of outbound delivery orders.
- Transportation Planning (SAP TM) or Shipment in ERP (LE-TRA) can create transportation units or vehicles, or both, to send the transportation planning information to EWM.

Yard Movements

Yard movements enable you to move TUs form one yard bin to another inside a yard. Examples of yard movements are as follows:

- The TU arrives at the checkpoint and is moved to a parking space or to a door.
- You move a TU from a parking space to a door, or from a door to a parking space.
- You move a TU within the yard, from one parking space to another, or from one door to another.

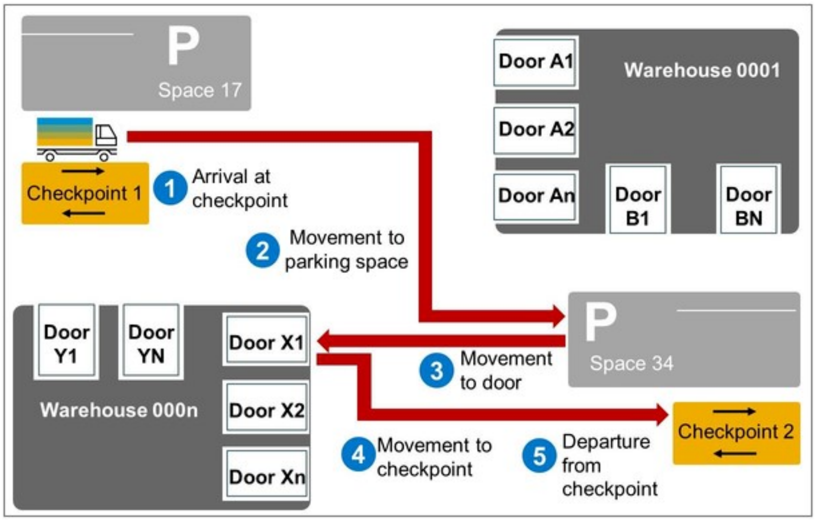


Figure 32: Movements in the Yard

Arrival at or Departure from a Checkpoint

The checkpoint is where you register the vehicles and TUs that enter or exit the yard. You can perform this task by setting the status for the arrival at the checkpoint or departure from the checkpoint. This is a prerequisite for yard movements.

The exact steps you execute at the checkpoint depend on whether you have obtained the vehicle data and transportation unit data in advance through advanced shipping notification, for example, or whether you first have to record this when the vehicle has arrived.

- Data is already available.

In the function *Arrival at/Departure from Checkpoint* , you set the status *Arrival at Checkpoint* for the vehicle. To do this, on the EWM *Index* screen, choose *Extended Warehouse Management* → *Goods Receipt and Shipping* → *Yard Management* → *Arrival at/Departure from Checkpoint* (transaction `/SCWM/CICO`).

- Data has to be recorded.

1. You create the vehicle in the system (transaction `/SCWM/CICO` or `/SCWM/VEH`).
2. You create a TU if required and assign it to the vehicle. To do this, on the EWM *Index* screen, choose *Extended Warehouse Management* → *Goods Receipt and Shipping* → *Maintain Transportation Unit* (`/SCWM/TU`).
3. You register the arrival of the vehicle by setting the status *Arrival at Checkpoint* (transaction `/SCWM/CICO` or `/SCWM/VEH`).
4. You register the TUs (transaction `/SCWM/TU`).

   In the following cases, you can also post the arrival at checkpoint in this transaction right away:

   - When the TU is not assigned to a vehicle
   - When the TU is assigned to a vehicle that has only one TU
5. You assign deliveries and handling units to the TUs (transaction `/SCWM/TU`).

Transportation Unit Movement in the Yard

Only with the activation of Yard Management is it possible to move a TU in the yard. Without Yard Management you just record the arrival and departure of a TU at a checkpoint or a door.

Each time you want to move a TU in the yard, you have to create a warehouse task (WT) manually. To do this, you use a special transaction to create WTs in the yard. You can also create and execute yard movements in a radio frequency (RF) environment.

Transportation Units and Deliveries

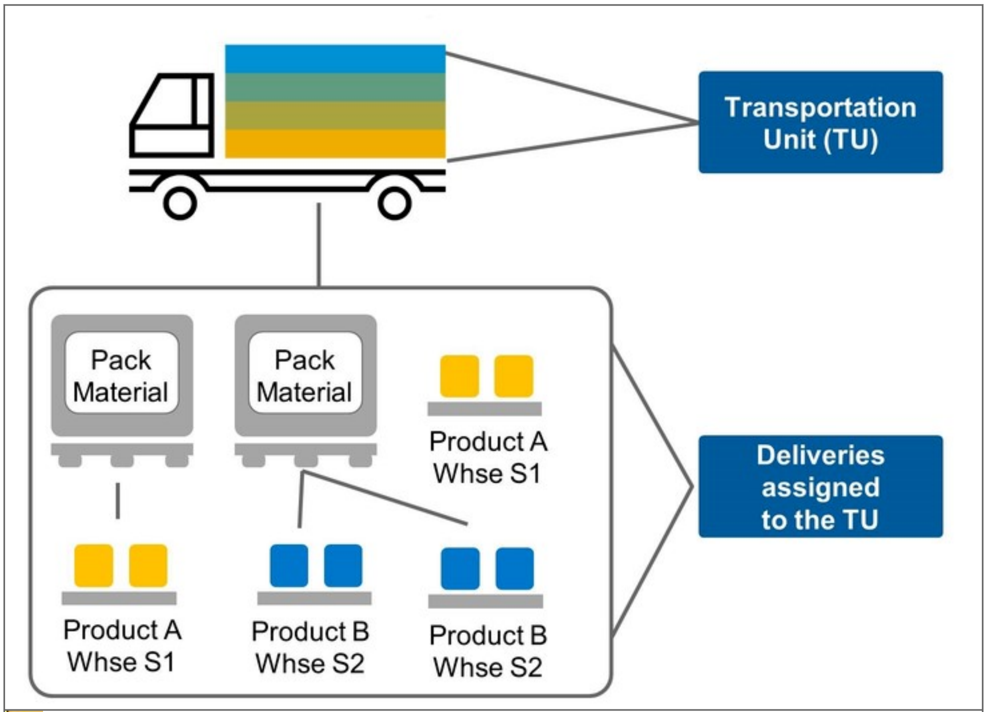


Figure 33: Transportation Units and Deliveries

You assign deliveries to transportation units. This can happen manually during or after the creation of the TU. It can also happen automatically when the TU information is already in the document coming from ERP. In this case, the TU creation and the assignment of the deliveries happens in the background.

Yard Logistics

While not every customer needs extensive processes in the yard, others require more planning and monitoring features that EWM yard management provides. The *SAP Yard Logistics* solution provides check-in to check-out support for transportation units and is focused on the functionalities of planning, execution, yard operations, yard monitoring and billing. It is based on the structures used in EWM, so it can be used as part of your EWM warehouse, or standalone, for example in a container terminal.

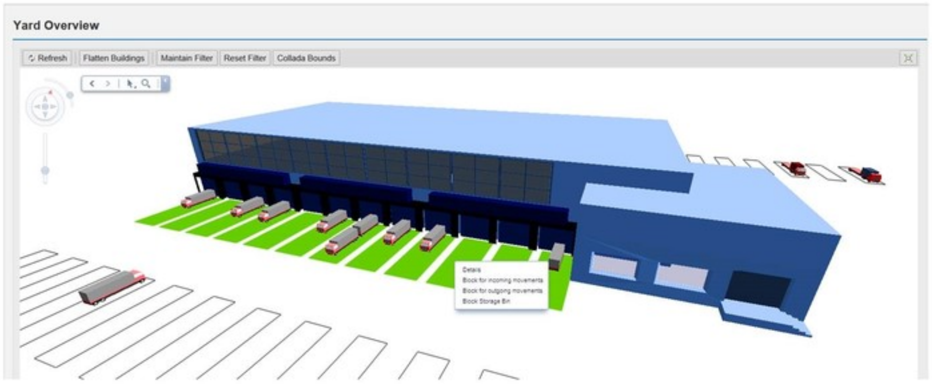


Figure 34: Yard Logistics

Dock Appointment Scheduling

You can use SAP Dock Appointment Scheduling to plan vehicle arrivals in your warehouses efficiently, and to collaborate with the parties involved in an appointment.

- Planning for the Warehouse

  Planning of vehicle arrivals at the warehouse, and loading and unloading of the vehicles, is important for managing the efficient running of the warehouse, and for balancing the workload across the working day.

  You can use SAP Dock Appointment Scheduling to schedule loading appointments for loading and unloading vehicles and to get an overview of the workload of a loading point for each day.

- Planning for the Carrier

  For a carrier, planning is important to reduce the amount of time when the vehicles are not available for use, for example, if they are waiting to be unloaded.

  Carriers with access to the system can plan loading appointments for their own vehicles directly in the system, and update details of their loading appointments.

Deployment Options

SAP Dock Appointment Scheduling can be deployed standalone or integration with a local SAP EWM system.

SAP Dock Appointment Scheduling Structure

SAP Dock Appointment Scheduling uses its own structure which is connected with EWM structures for an integrated scenario.

- Docking Locations

  A docking location represents a group of loading points, such as a warehouse or distribution center. A docking location represents the geographical location of the loading points, and can be used to define attributes of the loading points that are fixed across the entire location, such as the address.

  If you use SAP Dock Appointment Scheduling integrated with SAP EWM, the docking location represents the SAP EWM warehouse in SAP Dock Appointment Scheduling.

- Loading Points

You plan loading appointments for vehicles based on loading points. A loading point represents a set of warehouse docks that are identical from the processing point of view, for example, loading or unloading. In reality, these docks could be docks, fuel dispensers, or any location where goods arrive at a warehouse or leave a warehouse. You can group the loading points of one geographical location into a docking location.

If you use docking locations, the integration with SAP EWM must be identical for all the loading points belonging to the docking location and the docking location itself. If you do not use docking locations, you can define if the loading point is integrated with SAP EWM for each loading point individually. Although you can work exclusively with loading points, SAP recommends that you create docking locations to group your loading points for your warehouses.

Data Maintenance

Other data that you maintain at the loading point includes the following:

- Time Slots

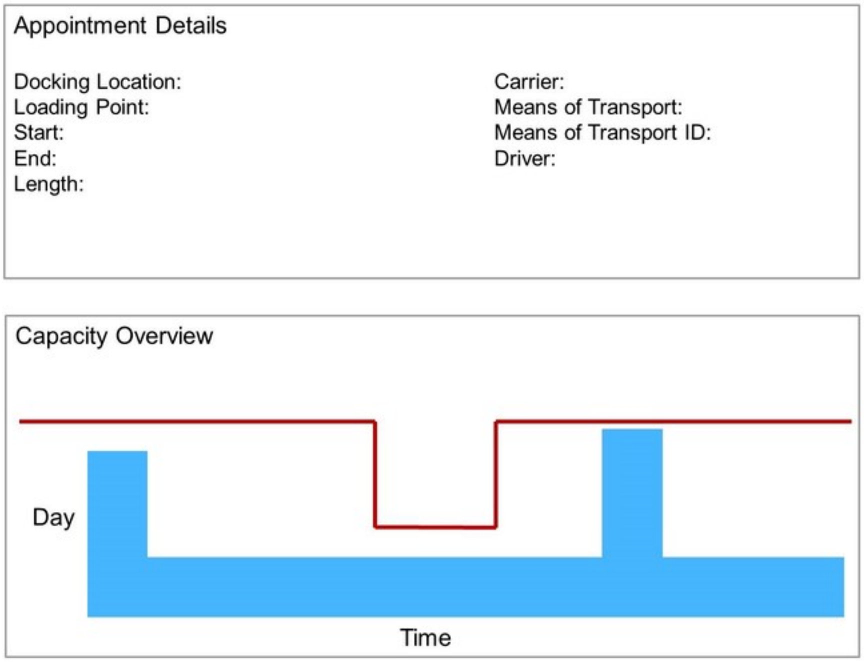
  You use time slots to plan the times of loading appointments. You define the duration of the time slots in the loading point. Each time slot has the same fixed duration and a capacity, which indicates the maximum number of vehicles that can be loaded or unloaded at the same time in the time slot.

- Restricted Planning Period

  During the restricted planning period, appointment planners for carriers must contact the warehouse directly if they want to reschedule or cancel one of their own appointments. During this period, they can still change the details of the appointment, for example, the driver. Up until the restricted planning period begins, appointment planners for carriers can change the details of their own appointments, reschedule their appointments, and cancel their appointments.

- Arrival Lead Time

  If you always require a fixed amount of time for each loading appointment prior to the vehicle arriving at the dock to perform checks and paperwork at the checkpoint, you can specify this time in the loading point. The system uses this arrival lead time to calculate the time when the vehicle should arrive at the checkpoint before the start of the appointment.



Appointment Details

Docking Location:
Loading Point:
Start:
End:
Length:

Carrier:
Means of Transport:
Means of Transport ID:
Driver:

Figure 35: Dock Appointment Scheduling

Supply Chain Unit of a Docking Location or a Loading Point

The system links each docking location and each loading point to a supply chain unit (SCU) with the same name. You can specify an SCU that already exists. If you do not specify an SCU for the docking location, the system automatically creates a new SCU using the name of the docking location or the loading point.

If the system creates a new SCU, it uses the data you enter in the docking location or loading point in SCU-specific fields, such as address data, time zone, or factory calendar, during the SCU creation. The SCU for a docking location has the business attribute docking location (DL), the SCU for a loading point has the business attribute loading point (LP).

If you create a docking location or loading point for an SCU that already exists, the SCU must have the corresponding attribute, if it does not have it yet, the system automatically assigns the business attribute.

Appointment Planning

You plan loading appointments for vehicles in collaboration with the carriers, and process the loading appointments in the system. As the loading appointment proceeds, the system records the time of each status change for later analysis.

You can plan loading appointments with different durations for the same loading points.

The system can determine the loading point of a loading appointment automatically, based on properties of the loading appointment and loading points. For example, if you have a loading appointment for a delivery of frozen goods, and a designated loading point for frozen goods, the system can automatically determine that the loading appointment should be planned for the loading point for frozen goods.

The system can also determine the duration of a loading appointment automatically, based on the number of packages in the loading appointment, the duration per package, and the amount of offset time a vehicle needs at the dock for activities such as arriving at the dock. For example, for a specific loading point, you can define that unloading one package takes two minutes, and that you require an offset of 10 minutes for each loading appointment. Using these definitions, the system calculates 30 minutes for a loading appointment with 10 packages to unload.

Collaboration with Carriers

For a carrier, planning is important to reduce the amount of time when the vehicles are not available for use, for example, if they are waiting to be unloaded.

You can allow appointment planners for carriers to plan appointments directly in the system by creating business partner roles for them. This means that the carriers can accurately plan for their vehicles, which results in more accurate scheduling for the warehouse. The appointment planners for carriers can display their own carrier's appointments only.

The collaboration with appointment planners for carriers is based on the following:

- A user with restricted authorization.
- A business partner that represents an appointment planner for a carrier. The user is assigned to this business partner.
- An assignment of the appointment planner for a carrier to a specific carrier. With this, you limit the access to appointments of this carrier only.

See the SAP Note “2065193 - Best practices for installing SAP Dock Appointment Scheduling "Collaboration with Carriers"” for the different available UI technology options and their respective prerequisites.

Shipping Cockpit

With the Shipping Cockpit, SAP offers a user-centric UI for the shipping office clerk to do the following:

- Plan shipping activities
- Execute tasks
- Monitor outbound operations in the warehouse

Recurring tasks can also be automated and controlled in the shipping cockpit.

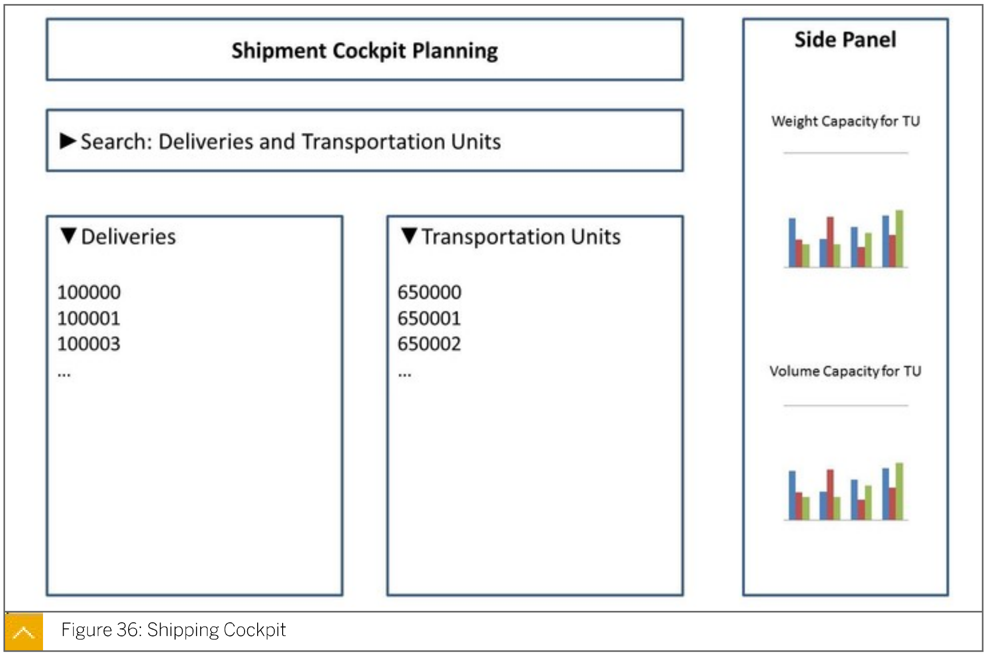


Figure 36: Shipping Cockpit

Outbound Planning Using the Shipping Cockpit

You can use the Shipping Cockpit — Planning to plan TUs. When planning transports for a given day, the shipping office clerk searches for unplanned outbound delivery orders (ODOs). The shipping office clerk creates TUs in the system and assigns the unplanned ODOs to these TUs, based on constraints of weight, volume, and time. This planning is based on the header assignments of ODOs to TUs, so it is always for the complete ODO. The planning can also be done automatically with the report /SCWM/R_TUDLV_AUTOPLAN_DLV and used as approximate planning, so the shipping clerk makes adjustments to the proposed plan.

When the shipping office clerk and the carrier have agreed upon the planned arrival of the TU, the shipping office clerk enters this information in the system. Integration with SAP Dock Appointment Scheduling provides more detailed support for time scheduling, but is not mandatory. The shipping office clerk checks which staging area is to be used for staging the goods and assigns a staging area if one is not already assigned. The clerk may decide to plan the door that will be used for loading when the truck arrives, and to trigger the warehouse process with wave creation.

The assignment of the staging area and the creation of waves can also be done by a scheduled report. The report /SCWM/R_TUDLV_AUTOPLAN_TU is used to create waves automatically for the outbound delivery orders that are assigned to TU activities, and to plan staging area and staging bay assignments for TU activities.

Outbound Execution Using the Shipping Cockpit

You can use the Shipping Cockpit – Execution for outbound execution using transportation units TUs. It focuses on the main execution and monitoring tasks that are performed in the shipping office.

The shipping office clerk monitors the warehouse progress of the ODOs assigned to TUs that are due to leave the warehouse today, to recognize potential delays. If a truck arrives, the shipping office clerk, for example, posts arrival at a checkpoint and assigns a door. If yard management is not active, movements, for example those from the checkpoint to the assigned door, can also be registered in the shipping cockpit.

Using Side Panels

Using side panels in the shipping cockpit enables you to display additional context information on demand. The side panel content can be enhanced and adjusted with minimal effort to suit the user's needs.

Standard side panel content contains, for example:

- Transportation unit (TU) weight and volume capacities (in the planning view only)
- Carriers per route (in the planning view only)

LESSON SUMMARY

You should now be able to:

- Set up yard management
- Perform yard movements
- Schedule a dock appointment
- Plan shipping activities with the shipping cockpit

Unit 4
Lesson 2

Setting Up the Determination of Staging Areas, Doors, and Routes

LESSON OVERVIEW

In this lesson, you learn about setting up the determination of staging areas and doors in SAP EWM. This lesson also covers route determination settings and delivery splits.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up the determination of staging areas, doors and routes.

Staging Areas and Doors

Staging areas are used for the interim storage of goods in the warehouse. They are located in close proximity to the doors assigned to them.

You can define staging areas for different purposes and even simultaneously for multiple purposes:

- Goods receipt

  Interim storage of unloaded goods until they are put away.

- Goods issue

  Interim storage of picked goods until they are loaded.

Doors are locations in the warehouse where the goods arrive at or leave the warehouse. The door is an organizational unit that you assign to the warehouse number. Vehicles and their TUs drive up to the doors of a warehouse to load or unload goods there. The doors are in close proximity to the relevant staging areas.

You can assign the following directions to a door:

- Inbound
- Outbound
- Inbound and outbound

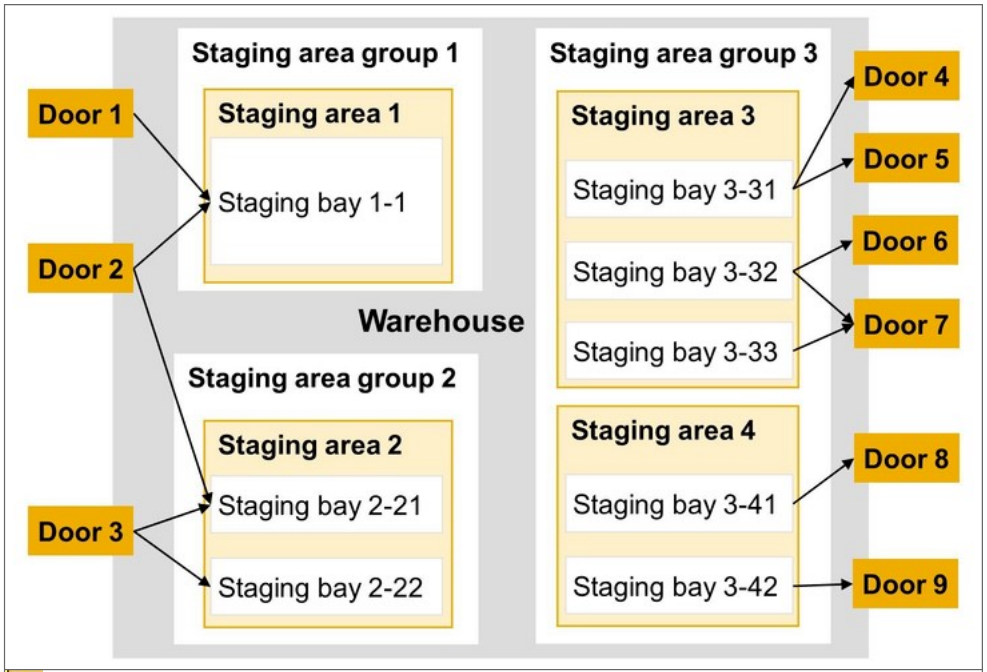


Figure 37: Staging Areas and Doors

Structure

You assign each door to a storage bin that you can use to post goods receipts or goods issues. You assign this storage bin to a storage type with the storage type role F. You can also assign doors to supply chain units to control authorization checks. You can also assign doors to yard bins.

Staging Area and Door Determination

The system can determine the following values by using determination rules:

- Staging area groups

  A staging area group is a storage type with the role D.

- Staging area

  A staging area is a section in a storage type which has the role staging area group.

- Staging bays

  A staging bay is a bin in a staging area.

- Doors

Staging area and door determination runs automatically in the background when you create or change a delivery (outbound delivery order or inbound delivery) in SAP EWM. In the outbound delivery process, it runs after route determination since the route influences the determination of staging areas and doors.

Note:
The automatic assignment of TUs to staging bays in the shipping cockpit is only relevant if the determination is not done in the delivery item.

Define Determination Rules

You must define determination rules to allow the system to perform staging area and door determination in the background. Firstly, you must specify which values the system is to compare with the values in the delivery.

The values used for the determination depend on the direction of the process:

- Inbound delivery process:
  - Warehouse process type
  - Staging area or door determination group
- Outbound delivery process
  - Routes
  - Departure calendar
  - Staging area or door determination group
  - Destination sequence numbers

Determine Staging Areas and Doors

When you use the integration with the transportation (LE-TRA) component of SAP ERP, you can also use the following information from the shipment to determine staging areas and doors:

- For inbound processing:
  - Carrier
  - Means of transport
  - Handling unit (HU) type of packaging material
- For outbound processing:
  - Carrier
  - Ship-to party
  - Means of transport
  - HU type of packaging material

Route Determination

SAP EWM can work with the following routes in the delivery processing:

- Route (SD)

  This is the route that can be entered in the SD sales order in SAP ERP, for example, or determined by ERP route determination. It influences transportation scheduling. For example, the system can determine from the route that goods are to be sent by rail to Boston. Therefore, during transportation scheduling, the system takes into account how far in advance loading space in the freight car must be reserved. The ERP route determination can also determine a route schedule.

- Route (SCM)

  This is the route used in SCM/EWM route determination, for example, which is also transferred from an SAP CRM system. This route is sometimes called the Geo route. It is a sequence of legs that are connected by transshipment locations. This route represents a framework that comprises multiple trips.

Note:
See the section about routes in SAP S/4HANA embedded EWM later in the text.

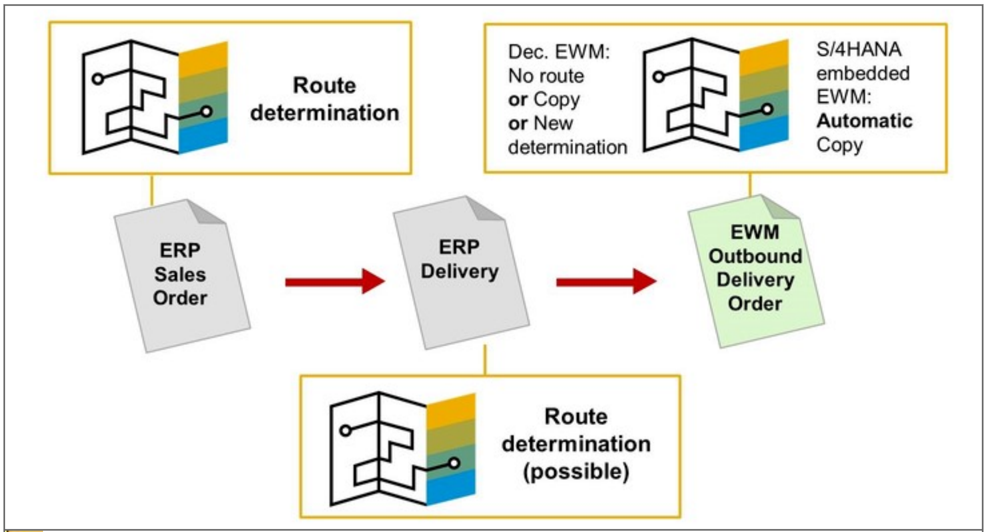


Figure 38: Route Determination

Copy ERP Route

In Customizing, you can set up how and which route data or route schedule is to be copied from the SAP ERP system into the SAP EWM system.

The following settings are possible:

- Route (SCM) is used

  This setting is active in the standard system. The route may come from an SAP SCM system, for example. This route is usually filled if you are working with a SAP CRM system in which routes from an SAP SCM system are used (for example, by the availability check).

- Use Route (SD) if Route (SCM) is initial

  An SD route that may exist in the document is only used if the route (SCM-EWM) is not filled at the same time.

- Use Route (SD) if Route (SD) and Route Schedule are filled

An SD route that may exist in the document is only used if the SD route and route schedule are transferred from the SAP ERP system.

Depending on the above settings, the *Origin of Route Master Data* indicator is also set in the delivery. Note that, if neither a route (SCM) or a route (SD) exist in the document, the indicator is left blank, which means *Route and Departure Calendar from SCM* .

Route Determination in EWM

Route determination in SAP EWM is based on the SAP SCM routing guide. If activated, it runs automatically in the background.

To perform route determination, you must enter some basic Customizing settings under *SCM Extended Warehouse Management* → *Extended Warehouse Management* → *Goods Issue Process* → *Outbound Delivery* → *Route determination* → *Activate or Deactivate Route Determination*. Here, you can also deactivate route determination for certain combinations of warehouse number, document type, and document category. If a route originates from SAP ERP, you can specify that a route determination in SAP EWM shall not proceed. You have defined the following in the master data for transportation (route determination):

- General transportation cost profile
- Location
- Transportation lane
- Route
- Zone
- Carrier profile

> Note:
> The route determination based on the SAP SCM routing guide is not available in SAP S/4HANA embedded EWM.

Routes in SAP S/4HANA Embedded EWM

In SAP S/4HANA with embedded EWM, the options of working with routes are different. The SAP SCM routing guide and it's route determination is no longer available here. Instead, the route determined in the sales order or the LE outbound delivery is copied into the EWM outbound delivery order automatically; no separate settings are required for this.

LESSON SUMMARY

You should now be able to:

- Set up the determination of staging areas, doors and routes.

Unit 4
Lesson 3

Planning Transportation

LESSON OVERVIEW

In this lesson, you learn about transportation in SAP Extended Warehouse Management (EWM). This lesson also covers transportation management integration with SAP EWM.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Plan transportation
- Integrate SAP ERP Transportation Planning with SAP EWM
- Integrate SAP Transportation Management (TM) with SAP EWM

Transportation in SAP Extended Warehouse Management (EWM)

SAP EWM can support customers in transportation planning.

Since SCM 7.0 enhancement package 1, SAP EWM offers an SAP ERP Transportation Management (LE-TRA) integration based on the IDoc interface already existing in SAP ERP. Apart from the new interface, this functionality is mainly integrated in existing SAP EWM functionalities. As a result, shipping and receiving objects like transportation units and vehicles, along with delivery processing objects and functions, are reused.

Since SAP EWM 9.0, the integration with SAP TM is also possible. This integration also uses SAP ERP LE-TRA to create shipments and for the communication with SAP EWM. Since SAP, EWM 9.1 a direct integration with SAP TM is available.

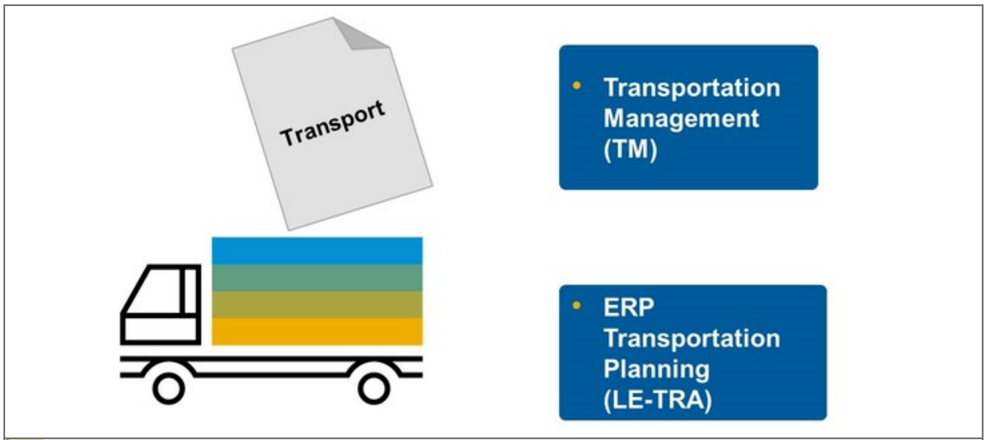

Transport
• Transportation Management (TM)
• ERP Transportation Planning (LE-TRA)

Figure 39: Planning Transportation

SAP ERP LE-TRA Integration with SAP EWM

SAP EWM offers integration with the transportation (LA-TRA) component of SAP ERP. Here, you can control and monitor the entire transportation process from the planning stage to goods receipt or goods issue.

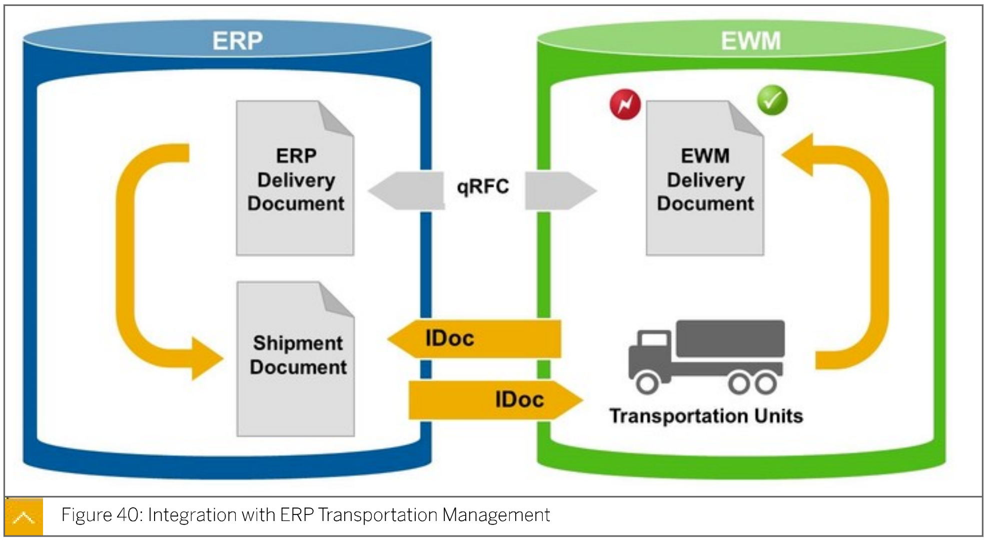


Figure 40: Integration with ERP Transportation Management

Inbound Processing with Transportation Integration

When you create a delivery in SAP ERP, the system copies it to SAP EWM. You can then create a shipment in SAP ERP and assign inbound deliveries to it. When the planning for the shipment is completed, the system copies the shipment with the assigned inbound deliveries to SAP EWM through the *SHPMNT05* IDoc. After receiving the IDoc in SAP EWM, the system creates TU activities automatically (and, optionally, a vehicle activity) for the shipment with the assigned inbound deliveries. You can then process the unloading, the goods receipt, and the putaway by using the desktop or radio frequency transactions.

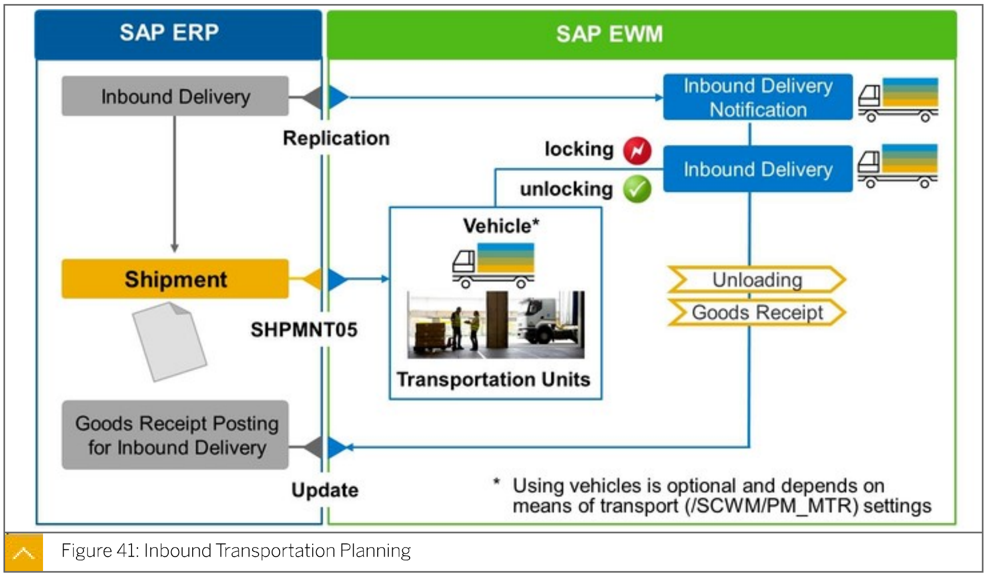

SAP ERP
SAP EWM
Inbound Delivery
Replication
Inbound Delivery Notification
locking
unlocking
Inbound Delivery
Vehicle*
Shipment
SHPMNT05
Unloading
Goods Receipt
Transportation Units
Goods Receipt Posting for Inbound Delivery
Update
* Using vehicles is optional and depends on means of transport (/SCWM/PM_MTR) settings

Figure 41: Inbound Transportation Planning

Outbound Processing with Transportation Planning in SAP ERP

When you create a delivery in SAP ERP, the system copies it to SAP EWM. You can then create a shipment in SAP ERP and assign outbound deliveries to it. When you save the shipment with the assigned outbound deliveries, the system copies it to SAP EWM through the *SHPMNT05* IDoc. After receiving the IDoc in SAP EWM, the system automatically creates corresponding TU activities (and optionally a vehicle activity). You can then process the picking (and optionally the packing and the loading) by using the desktop or radio frequency transactions. After loading is completed, you can post the goods issue. When the system has set the Goods Issue Posted status of the TU, the system replicates the TU to SAP ERP through the *SHPMNT05* IDoc as an update of the existing shipment in SAP ERP.

Since EWM 9.4, it is possible to send update information when the truck arrives at the checkpoint, and when loading is started or when loading is completed. With SAP Note 2181853 - EWM: Multiple updates of SAP ERP shipment via IDoc, it is also possible to implement this in earlier releases.

Based on the assigned HU data from SAP ERP, the system creates TU activities and vehicle activities as follows:

- If you have one HU assigned to the shipment and you have selected the *Optional* checkbox in *Link Between Packaging Material (TU) and Means of Transport* (transaction /SCWM/PM_MTR), the system only creates a TU activity.
- If you have one HU assigned to the shipment and you have not selected the *Optional* checkbox in *Link Between Packaging Material (TU) and Means of Transport* (transaction /SCWM/PM_MTR), the system creates a TU activity and a vehicle activity.
- If you have more than one HU on the same level, the system uses the first HU to create a vehicle activity and it uses the remaining HUs to create TU activities.
- If you have nested HUs, the system uses the highest-level HU to create a vehicle activity and the lower-level HUs to create TU activities.

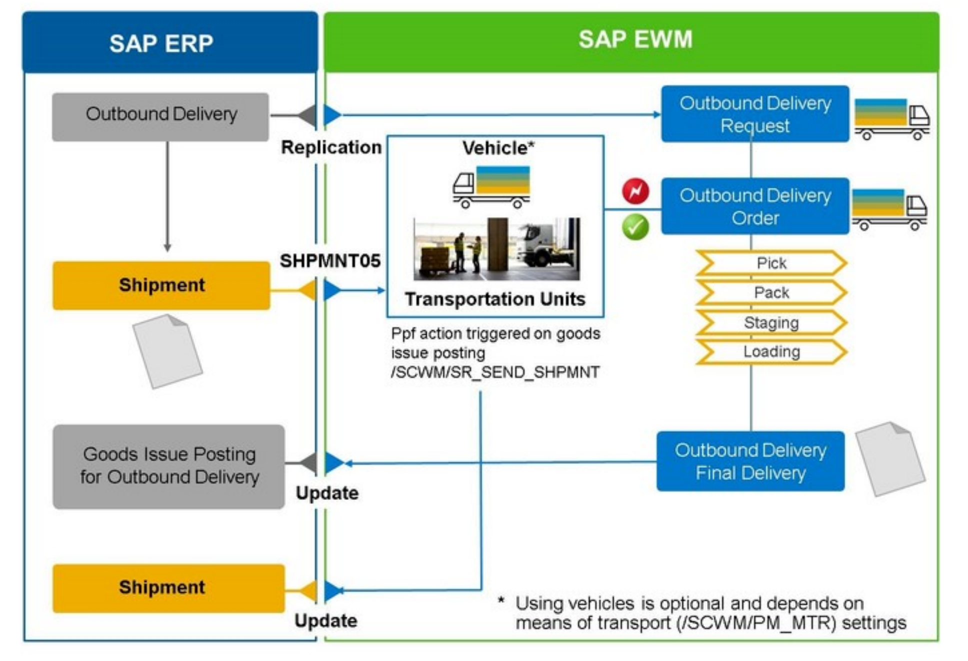

SAP ERP
SAP EWM
Outbound Delivery
Replication
Outbound Delivery Request
Vehicle*
Outbound Delivery Order
SHPMNT05
Shipment
Transportation Units
Pick
Pack
Staging
Loading
Ppf action triggered on goods issue posting /SCWM/SR_SEND_SHPMNT
Goods Issue Posting for Outbound Delivery
Update
Outbound Delivery Final Delivery
Shipment
Update
* Using vehicles is optional and depends on means of transport (/SCWM/PM_MTR) settings

Figure 42: Outbound-ERP Planning

Outbound Processing with Transportation Planning in SAP EWM

When you create a delivery in SAP ERP, the system replicates it to EWM. In EWM, you assign the delivery to a TU (and, optionally, a vehicle). You can then process the picking (and, optionally, the packing and the loading) by using the desktop or radio frequency transactions. After loading is completed in the system, you can post the goods issue. When the system has set the *Goods Issue Posted* status of the TU, the system replicates the TU to SAP ERP through the *SHPMNT05* IDoc and creates a new shipment in SAP ERP.

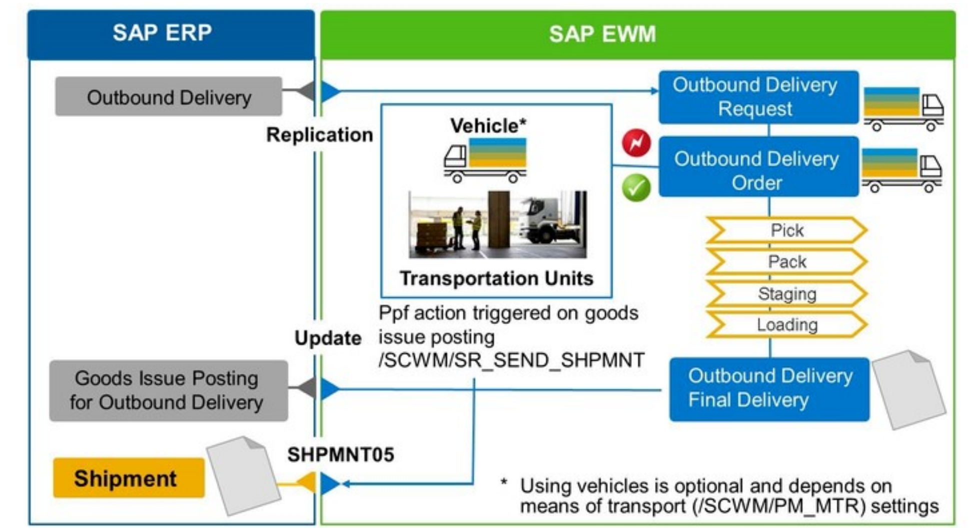

SAP ERP
SAP EWM
Outbound Delivery
Replication
Outbound Delivery Request
Vehicle*
Outbound Delivery Order
Transportation Units
Pick
Pack
Staging
Loading
Update
Ppf action triggered on goods issue posting /SCWM/SR_SEND_SHPMNT
Goods Issue Posting for Outbound Delivery
Outbound Delivery Final Delivery
SHPMNT05
Shipment
* Using vehicles is optional and depends on means of transport (/SCWM/PM_MTR) settings

Figure 43: Outbound-EWM Planning

SAP TM Integration with SAP EWM

Since SAP EWM 9.0, the integration with SAP TM is possible. In the first release, the communication was not directly between SAP TM and EWM. Instead, it used SAP ERP TM to create shipments and for communication. With SAP EWM 9.1, the communication between SAP TM and EWM is possible directly.

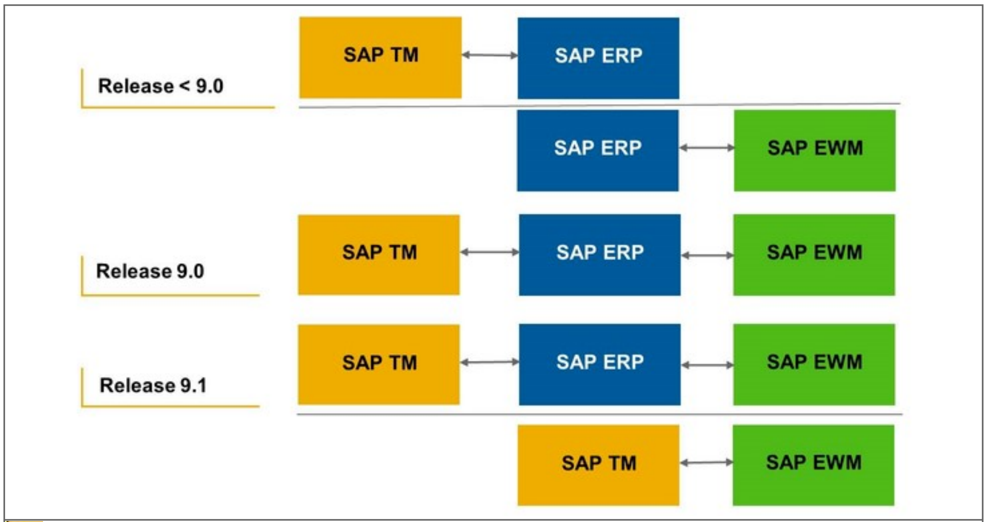


Figure 44: TM–ERP–EWM Integration

Direct TM-EWM Integration

Freight order data in transportation management and vehicle or TU data in SAP EWM can be transferred between SAP TM and SAP EWM using enterprise services. This communication can be realized using SAP NetWeaver Process Integration, or using point-to-point communication (Web Services Reliable Messaging).

If the transportation planning in SAP TM is based on orders and deliveries that are created in an SAP ERP system, the delivery execution information is communicated from SAP EWM to TM using ERP to update the corresponding transportation requirements in SAP TM. The execution information in the freight orders however, is only based on the data communicated directly by SAP EWM.

LESSON SUMMARY

You should now be able to:

- Plan transportation
- Integrate SAP ERP Transportation Planning with SAP EWM
- Integrate SAP Transportation Management (TM) with SAP EWM

Unit 4

Learning Assessment

1. What is the purpose of yard management?

___

___

___

2. Which of the following structures are possible in a yard?

   Choose the correct answers.

   ☐ A Parking spaces

   ☐ B Doors

   ☐ C Transportation units

   ☐ D Checkpoints

3. The collaboration with appointment planners for carriers is based on which of the following:

   Choose the correct answers.

   ☐ A A user with complete authorization

   ☐ B A business partner that represents an appointment planner for a carrier

   ☐ C An assignment of the appointment planner for carrier to a specific carrier

   ☐ D A user with restricted authorization

4. With the Shipping Cockpit SAP offers a user-centric UI for the shipping office clerk to do the following:

   Choose the correct answers.

   ☐ A Plan shipping activities

   ☐ B Execute tasks

   ☐ C Monitor outbound operations in the warehouse

   ☐ D Execute a delivery order

5. What values can the system determine using determination rules?

   Choose the correct answers.

   ☐ A Staging bays
   ☐ B Staging area
   ☐ C Warehouse process type
   ☐ D Doors
   ☐ E Staging area groups

6. What functionality is possible when integrating with SAP TM?

   ____
   ____
   ____

7. Inbound processing with transportation integration steps.

   Arrange these steps into the correct sequence.

   ☐ The system creates TU activities
   ☐ System copies created delivery from SAP ERP to SAP EWM
   ☐ The system copies the shipment with the assigned inbound deliveries to SAP EWM
   ☐ You create a shipment in SAP ERP and assign inbound deliveries to it
   ☐ You process the unloading, the goods receipt, and the putaway

8. What processes are supported by the SAP TM with EWM?

   Choose the correct answers.

   ☐ A Outbound process with order-based transportation planning in SAP TM
   ☐ B Outbound process with transportation planning in SAP ERP
   ☐ C Outbound process with delivery-based transportation planning in SAP TM
   ☐ D Outbound process with transportation planning in SAP EWM

Unit 4

Learning Assessment - Answers

1. What is the purpose of yard management?

   Yard Management extends warehouse management beyond the physical walls of the warehouse, enabling management and control from the time that goods are planned to arrive at the warehouse.

   That is correct. It enables you to manage various yard processes such as the check-in and check-out of vehicles.

2. Which of the following structures are possible in a yard?

   Choose the correct answers.

   ☒ A Parking spaces

   ☒ B Doors

   ☐ C Transportation units

   ☒ D Checkpoints

3. The collaboration with appointment planners for carriers is based on which of the following:

   Choose the correct answers.

   ☐ A A user with complete authorization

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   ☒ A Staging bays

   ☒ B Staging area

   ☐ C Warehouse process type

   ☒ D Doors

   ☒ E Staging area groups

6. What functionality is possible when integrating with SAP TM?

   SAP ERP TM is used to create shipments and to communicate with SAP EWM.

   That is correct. SAP ERP TM is used to create shipments and to communicate with SAP EWM.

7. Inbound processing with transportation integration steps.

   Arrange these steps into the correct sequence.

   4 The system creates TU activities

   1 System copies created delivery from SAP ERP to SAP EWM

   3 The system copies the shipment with the assigned inbound deliveries to SAP EWM

   2 You create a shipment in SAP ERP and assign inbound deliveries to it

   5 You process the unloading, the goods receipt, and the putaway

8. What processes are supported by the SAP TM with EWM?

Choose the correct answers.

☒ A Outbound process with order-based transportation planning in SAP TM

☐ B Outbound process with transportation planning in SAP ERP

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☒ D Outbound process with transportation planning in SAP EWM

UNIT 5

Optimization of Resources and Processes

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UNIT OBJECTIVES

- Set up travel distance calculation
- Use mobile devices
- Optimize mobile device processing
- Manage resources
- Set up system-guided or semi-system-guided processes
- Set up task interleaving
- Optimize warehouse orders
- Set up the pick, pack, and pass process

Unit 5
Lesson 1

Setting Up Travel Distance Calculation

LESSON OVERVIEW

In this lesson, you learn how to set up travel distance calculation. You also learn about the different types of networks. Finally, examples for travel distance calculation are provided.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up travel distance calculation

Travel Distance Calculation Method

The travel distance calculation calculates the distance that a warehouse worker must travel to execute a warehouse order. In addition to calculating the travel distance, the system determines the time required by a worker to execute the warehouse order, depending on the speed of the resource used.

The result of the travel distance calculation is used for:

- Calculating the latest start time for a warehouse order
- Calculating engineered labor standards (ELS) and the workload, if you have activated Labor Management (LM)

Methods for Travel Distance

SAP EWM uses two different methods for the distance calculation:

- Direct distance

  The system calculates the travel distance using the direct distance, based either on the Euclidean metric or Manhattan metric. The upper part of the following figure shows the direct distance between two storage bins of a storage type. The solid line corresponds to the Euclidean metric; the dotted line represents the Manhattan metric.

- Distance based on networks

  The travel distance calculation can also be based on an existing valid network. The valid routes represent the edges. The lower part of the following figure shows the distance between two storage bins of a storage type. The resource moves across the valid routes.

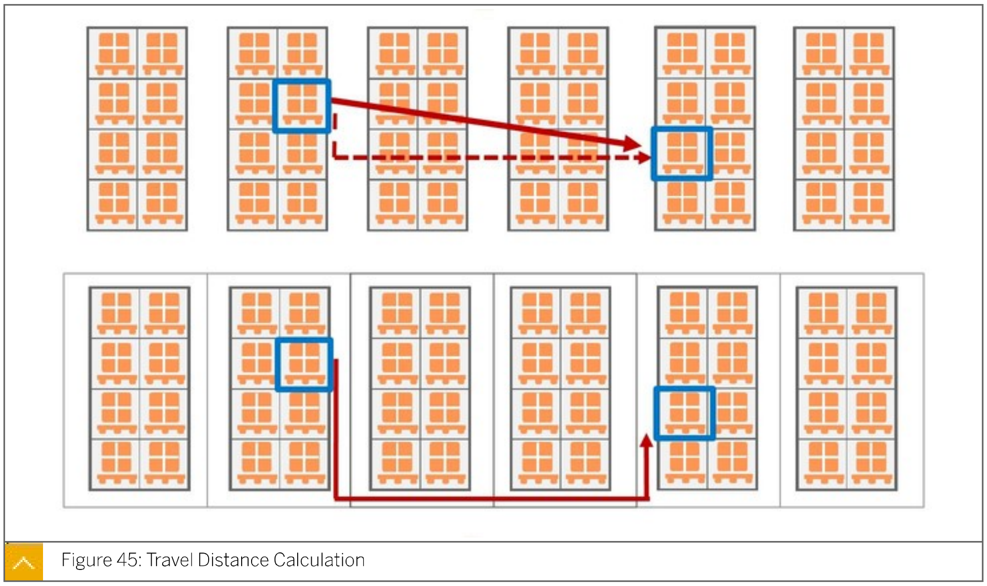


Figure 45: Travel Distance Calculation

Calculating the Travel Distance

The system calculates the travel distance needed to execute a warehouse order more than once, namely when:

- Creating a warehouse order for planning purposes
- Confirming a warehouse order for evaluation purposes

When calculating the distance while creating the warehouse order, the system estimates the following values:

- For the speed, the system uses the speed of the slowest resource (pessimistic approach).
- Instead of the known position of the resource, a default distance to be covered to reach the first position in a storage type is specified.
- The route network used (if available) contains all defined routes without resource type restrictions.

Only when confirming is the system able to access more detailed information, as only then is the executing resource known. The following information is then available:

- Speed of the resource
- Last position of the resource prior to executing the warehouse order
- The route network allowed for the resource, if available

If LM is activated, the system saves the result of the travel distance calculation in the planned and executed workload.

Networks

Networks define the valid routes (streets) in the warehouse on which the resources move. A network consists of edges and nodes. Edges are connected to each other by way of nodes. Edges represent the valid routes in the warehouse, and nodes represent crossings.

There are two different kinds of networks:

- Storage-type-specific networks

  These networks consist of edges that map the individual aisles, and edges that represent a connection of different aisles. You assign storage bins of a storage type to:

  - An edge, if the storage bins are located in an aisle, and an edge exists for the aisle
  - A node that matches your X and Y coordinates, if you have not assigned an edge

- Global networks

  The global network connects the defined, storage-type-specific networks to each other. If no storage-type-specific networks are defined, the network connects the storage bins to each other directly.

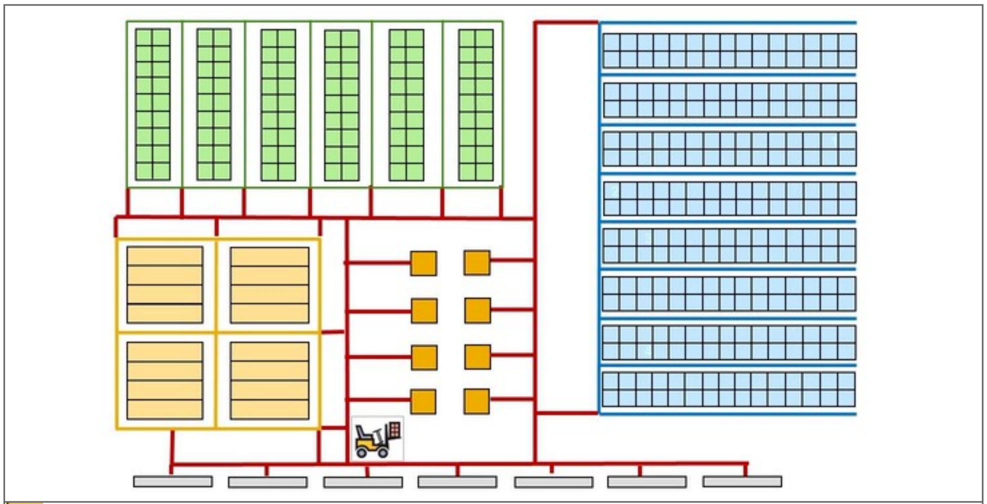


Figure 46: Travel Distance Calculation with Storage-Type-Specific and Global Networks

Edges

Edges have the following properties:

- Each edge has a start node and end node.
- An edge is usually passable in both directions, however it can also be defined as a one-way street. The direction is defined through the start and end nodes.
- For each edge, you can define which resource types are allowed to pass.
- You can assign an edge to an aisle.
- An edge has a length that is used by the system to calculate the travel distance, if the edge is passed by a resource.

Defining Networks

You can use the program, **Generating Storage-Type-Specific Networks** to generate storage-type-specific networks for the travel distance calculation in SAP EWM automatically.

On the SAP EWM *Index* screen, choose *Extended Warehouse Management* → *Settings* → *Travel Distance Calculation* → *Generate Network*. The edges for the aisles automatically have the following properties:

- Edges are only created for aisles that have more than one storage bin.
- Edges can be passed in both directions.
- The length of the edges corresponds to the Euclidean distance between the start and end nodes.
- If storage bins are located on both sides of the aisle, the edges are located in the center of the aisle.
- If there are only storage bins on one side of the aisle, the edges lie half a bin depth away from the aisle.
- The edges start and end outside the aisle (half a bin depth).

The system generates connecting edges between neighboring aisles by connecting both the start and end nodes of two neighboring aisles with an edge.

The storage-type specific network can also be created manually, but it is possible and therefore better to change settings like the direction (unidirectional, bidirectional) after the generation by the system. You can also exclude resource types from edges. In addition, you can add an average distance for a storage type, this is the distance that is used when the resource and the start point is not known.

You can define **global networks**manually and make the following settings for the edges:

- X and Y coordinates for the start of the edge
- X and Y coordinates for the end of the edge
- Define edge direction (unidirectional, bidirectional)
- Define edge length in the unit of length of the warehouse number
- Define excluded resource types

Both types of networks (storage-type specific and global) can also be uploaded with the help of a CSV file. This is a new feature since SAP EWM 9.5.

Travel Distance Calculation

The travel distance is calculated for the storage bin list. A storage bin list is a list of storage bins that are to be approached sequentially for a warehouse order.

Features

- The system differentiates between horizontal (X and Y coordinates) and vertical movements (Z coordinates).
- The total travel distance is the sum of travel distances that lie between the storage bins that lie next to each other on the list.
- The system generates the list of storage bins from the warehouse order creation rules. The order is fixed, meaning the travel distance calculation does not sort the storage bin list.

For the movements, we assume the following:

- The resource moves to the storage bin in a horizontal direction.
- The resource then executes the vertical movement to the storage bin and back to the outbound item.
- The resource then moves itself to the next storage bin in a horizontal direction.

- The total travel distance in a vertical direction therefore corresponds to twice the Z distance of the storage bins to the floor (point of origin Z = 0).

For horizontal movements, a distinction is made between direct movements and movements within a network.

Direct Movements

This system uses the direct distance for the following movements:

- Movements between storage bins within a storage type, if no valid storage-type-specific network is available
- Movements between storage bins from different storage types, if no global valid network exists
- Movements within an aisle. Here, the direct distance between storage bins is used to calculate the travel distance.

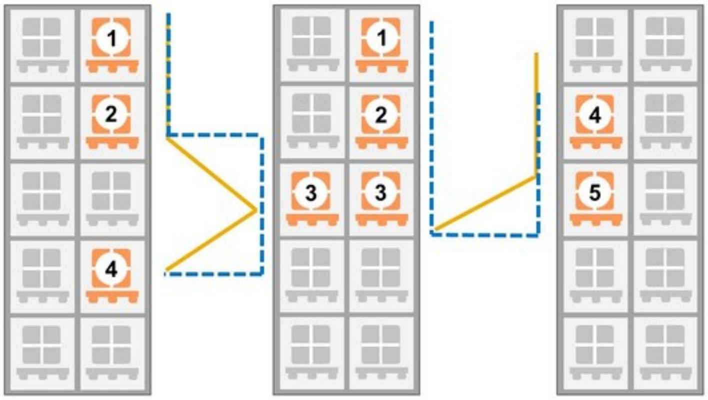


Figure 47: Direct Movements Within an Aisle

Connecting Storage Bin with the Network

You can connect a storage bin with the network using the following steps:

- With the nodes of an edge, if the storage bin is in an aisle, and an edge exists for these. Fundamentally, four options exist. For a one-way route, only one option is allowed — entering the edge at the start node and leaving it at the end node.
- With the next node, if no edge has been assigned (the node comes from the storage-type-specific network, or if the storage-type-specific network does not exist, the node comes from the global network).

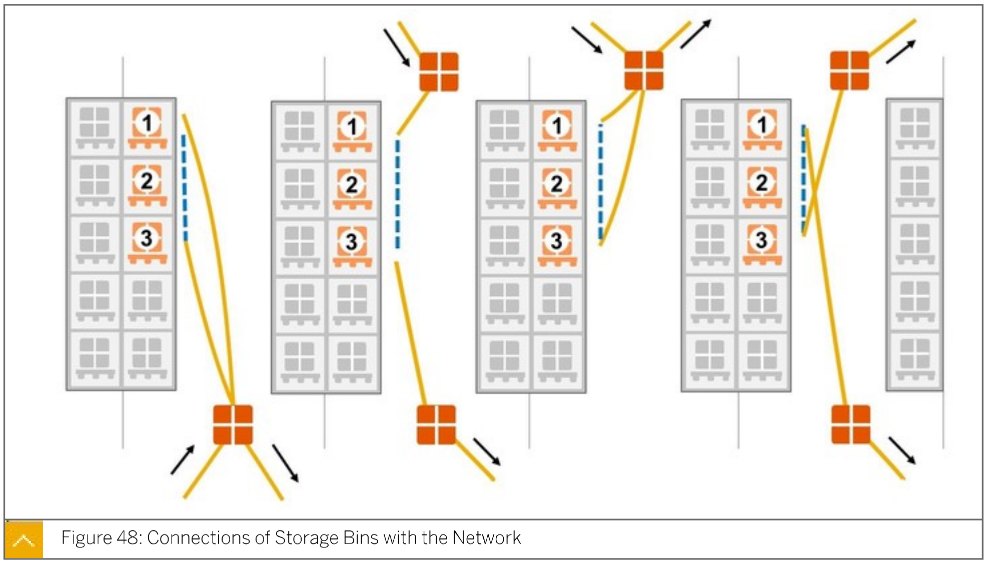


Figure 48: Connections of Storage Bins with the Network

Movements Within a Network

Movements within a network take place if the storage bins are located as follows:

- In the same storage type but not in the same aisle, and a valid storage-type-specific network exists
- In different storage types and a valid global network exists

For the calculation within the network (valid global network and any existing valid storage-type-specific networks), the system connects the storage bins with the nodes of the respective edge or with the next node. Then, the travel distance within the network between the storage bins is added to the assigned nodes. Four options are available for this calculation: 1) from the start node of the first edge to the start node of the second edge, 2) from start node to end node, 3) from end node to start node, and 4) from end node to end node.

Examples for the Travel Distance Calculation

The following are some examples for the calculation of the travel distance:

- Travel distance calculation within a storage type
- Travel distance calculation between two storage types with valid networks
- Travel distance calculation between two storage types with a global valid network

Travel Distance Calculation Within a Storage Type

The warehouse manager wants to calculate the travel distance from storage bin 1 to storage bin 3 within a storage type with a valid network.

1, 2, and 3 are storage bins from which warehouse worker X withdraws goods.

The travel distance comprises the following:

- Direct distances A (within an aisle), B, and D (connection between storage bin and network)
- Distance C (connecting edge) within the network

Of the four possible calculations, the system uses the first option as that represents the shortest travel distance.

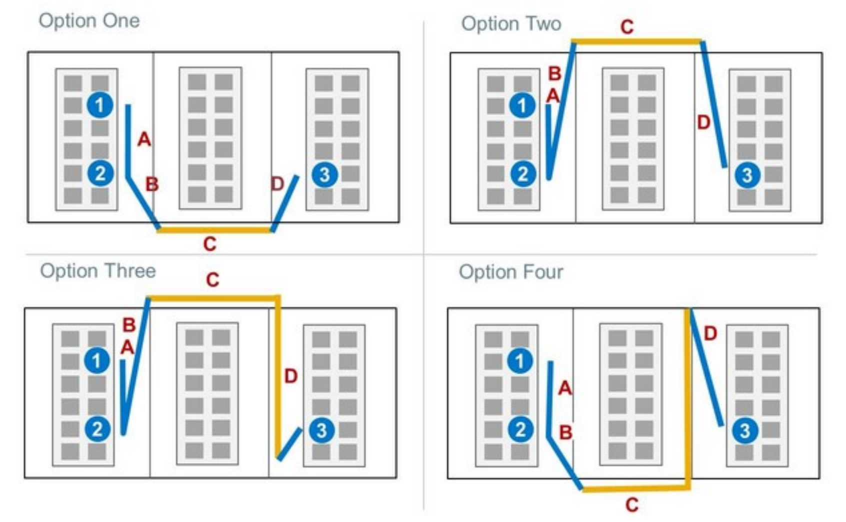


Figure 49: Travel Distance Calculation Within a Storage Type

Travel Distance Calculation Between Two Storage Types with Valid Networks

This example shows a travel distance calculation between two storage types that each have a valid storage-type-specific network and a valid global network.

The travel distance comprises the following:

- Direct distances A and C (connection between storage bin and network)
- Distance B within the entire network (local and global)

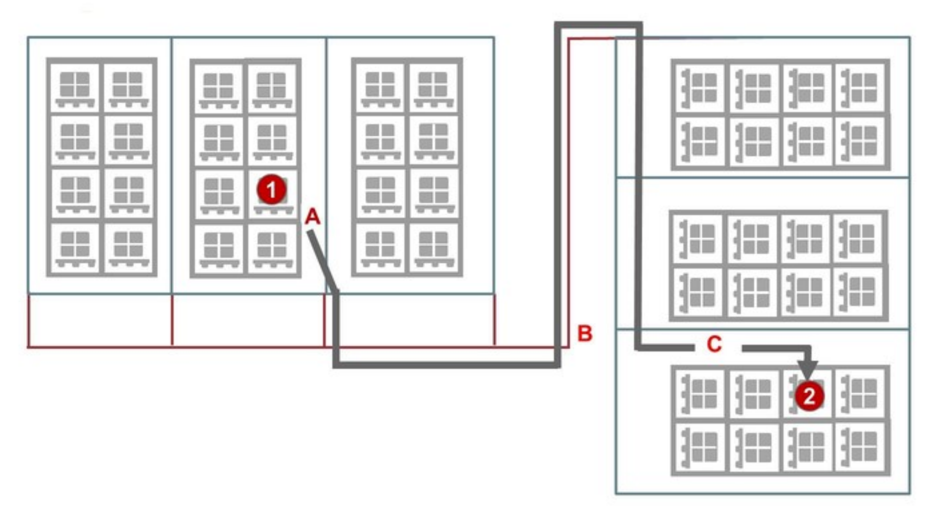


Figure 50: TwoStorageTypeswithStorage-SpecificNetworks_Image.ppt

Travel Distance Calculation Between Two Storage Types with a Global Valid Network

This example shows the travel distance calculation between two storage types with a valid global network.

Only one storage type has a valid network.

The travel distance comprises the following:

- Direct distances A and C (connection between storage bin and network)
- Distance within network B

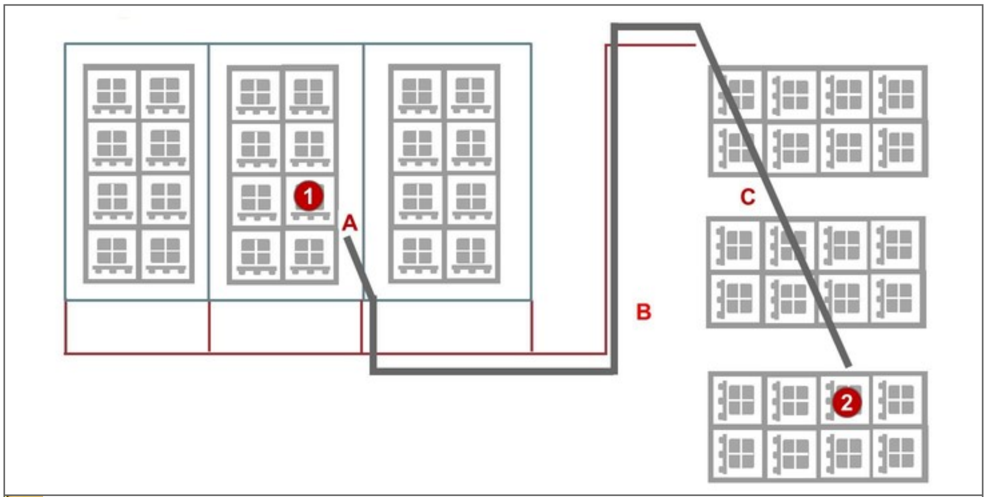


Figure 51: Two Storage Types with One Storage-Specific Network

Heuristics for the Travel Distance Calculation

Two heuristics exist for the travel distance calculation within a network:

- Depth-first search

  This system attempts to find a route between the specified nodes of a network in the shortest time possible. Here, the search runs in the direction of start node to end node. The search finishes when the first complete route is found.

- Breadth-first search

  The system looks for all possible routes in the network, and selects the one that has the shortest distance. This heuristic is more performance intensive at runtime, and is only appropriate for small networks.

The **stopping criterion**quickens the breadth-first search. This may have a negative impact on the solution quality, and the system may fail to find the shortest route. The parameter restricts the number of nodes that can be visited by a route, in relation to the route found by the depth-first search.

BAdIs for the Travel Distance Calculation

The following BAdIs are available:

- Change storage bin list for travel distance calculation /SCWM/EX_TDC_BIN_LIST

You can do the following:

- Sort the list.
- Delete storage bins from the list.
- Add new storage bins to the list.

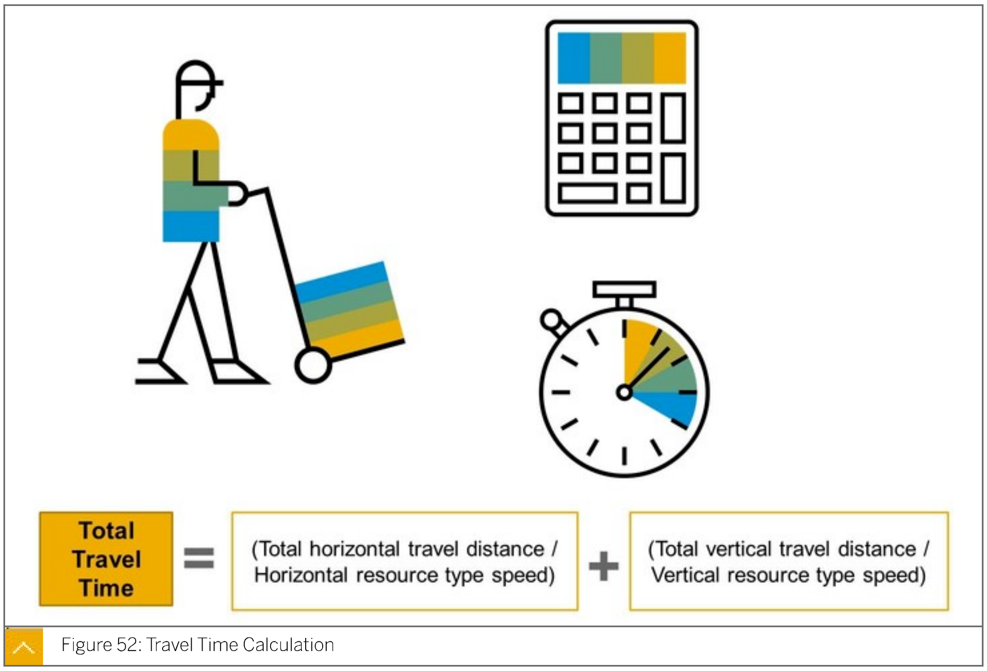
You can also influence the default distance to the first storage bin in the storage bin list.

- Travel distance calculation using the storage bin list /SCWM/EX_TDC_START

  The system calls this BAdI to calculate the travel distance of a warehouse order. If you implement this BAdI, you can define your own logic for calculating the travel distance along the sorted storage bin list transmitted to the BAdI.

Travel Time Calculation

The main goal of calculating the travel distance is to use it for a travel time calculation.



Total Travel Time = (Total horizontal travel distance / Horizontal resource type speed) + (Total vertical travel distance / Vertical resource type speed)

Figure 52: Travel Time Calculation

Default Travel Time Calculation

By default, the total travel time is calculated as follows: Total travel time = Horizontal travel time + Vertical travel time. The horizontal travel time is calculated using the total horizontal travel distance and the horizontal speed for the resource type. The vertical travel time is calculated using the total vertical travel distance and the vertical speed for the resource type.

Travel Time Calculation Using BRFplus

If you want to use a more complex travel time calculation, you can maintain your own set of calculation rules in BRFplus. SAP EWM provides a standard BRFplus application /SCWM/TDC_SYS and function /SCWM/TDC_CALC_TIME to which you can assign your own rulesets. The interface of the standard function includes the following:

- The total horizontal travel distance

- The total vertical travel distance
- Consolidated section information of horizontal movements
- Section information of vertical movements
- Resource type information (such as speed)
- Business information (such as activity area)

When you define your own rules, you can use any or all of the above information as input.

In contrast to the total travel distance, **consolidated section information** lets you consider each section of the calculated travel path separately. For example, you might want to consider turns and stops in the travel path, because they limit the maximum speed of a resource. The shorter a straight segment is, the less likely it is for the resource to travel at its maximum speed.

LESSON SUMMARY

You should now be able to:

- Set up travel distance calculation

Unit 5
Lesson 2

Using Mobile Devices

LESSON OVERVIEW

In this lesson, you learn how to use mobile data entry. This lessons also guides you through the radio frequency (RF) framework and how to navigate in that environment. You are also shown the settings for the RF framework.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use mobile devices
- Optimize mobile device processing

RF Framework

SAP EWM includes the implementation of a RF framework, which satisfies the following objectives:

- Decouples business logic from the physical presentation of application data on a selected presentation device and enables personalized menus and screens
- Supports a large variety of device sizes, device types, and data entry types

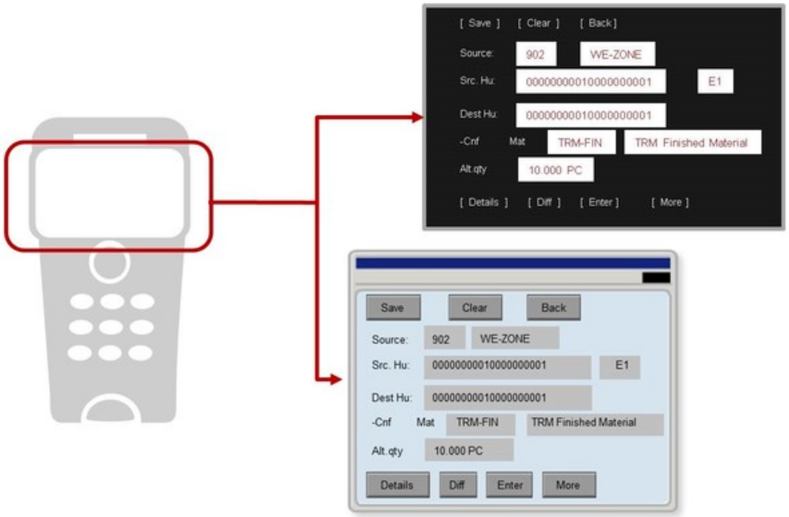
By providing an RF framework, error-free data communication can be attained in the warehouse through the use of mobile RF devices.

Figure 53: Using Mobile Devices

Support for GUI and Character-Based Devices and Browser-Based Devices

GUI devices are connected to the SAP system just like any other client-dependent PC.

The screens can be operated through touch screens, using predefined buttons, or they can be operated using a keyboard. If you are using touch screens, you press the appropriate positions on the touch screen instead of clicking with the mouse on a button.



[Save] [Clear] [Back]
[Details] [Diff] [Enter] [More]
Save
Clear
Back
Details
Diff
Enter
More

Source: 902 WE-ZONE
Src. Hu: 00000000010000000001 E1
Dest Hu: 00000000010000000001
-Cnf Mat TRM-FIN TRM Finished Material
Alt.qty 10.000 PC

Source: 902 WE-ZONE
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Figure 54: Character-based or Browser-based Devices

Character-based and Browser-based Devices

Character-baseddevices are linked to the system through SAPConsole. SAPConsole operates on a Windows NT/Windows 2000 platform and interacts with the RF terminals connected to it.

The system uses ITSmobile for connecting browser-based devices ITSmobile uses the ITS template technique to do this. This technique is based on the concept that an HTML template for visualization in the browser is provided for every screen (dynpro) of the application. You can include dynamic content or data in the templates at runtime using HTMLBusiness (HTMLB). ITSmobile is delivered with a new template generator that allows you to generate the templates of simple screens directly. You can then change these further to meet your requirements. You can also create a completely new template generator or create a new template generator based on the one delivered.

Barcode Support

The RF framework supports the use of barcodes for identification and verification purposes. SAP currently supports EAN 128 bar code types, but you can also support other types within the RF framework.

Screen Layout Personalization

Using the RF screen manager, you can customize the appearance of RF presentation screens to ensure that they are consistent with the attributes of the presentation devices being used.

Menu Personalization

Using the RF menu manager, you can define your own menus and menu hierarchy for the RF device transactions.

> Hint:
> SAP provides screens based on a screen size of 8x40.

Standard RF Functionalities

The SAP RF framework provides the following standard RF functionalities:

- Logon

  Logon to the RF environment enables the tracking of resources, stock on resources, and warehouse order (WO) selection. After logging on to the system, a resource can operate as an active resource, which can request and execute work in the warehouse.

- Logoff
- Recovery

  During logon, the system checks with the content provider whether the user is logged on as a resource, and if so, whether they were interrupted during WO execution. The system checks whether a specific WO assigned to the resource was stopped before completion. If yes, and if the WO can be locked, the system finds the WO's data and displays the screen of the relevant step to continue the process.

- Work execution transactions for the following warehouse processes:
  - Picking

- Putaway
- Loading
- Unloading
- Deconsolidation
- Packing
- Inventory
- Replenishment

RF Navigation

In the RF framework, both menu navigation and transaction navigation are supported on mobile devices.

The RF framework supports the following options for menu navigation to RF transactions:

1. Standard navigation

   You choose the required menu item.

2. Direct navigation to transaction

   You enter the number of the required menu item displayed in the *Menu* field.

3. Virtual navigation

   This option enables “virtual” navigation between menus. You enter the numbers of all required menu items, including those not displayed on the current screen, but rather displayed on subsequent screens.

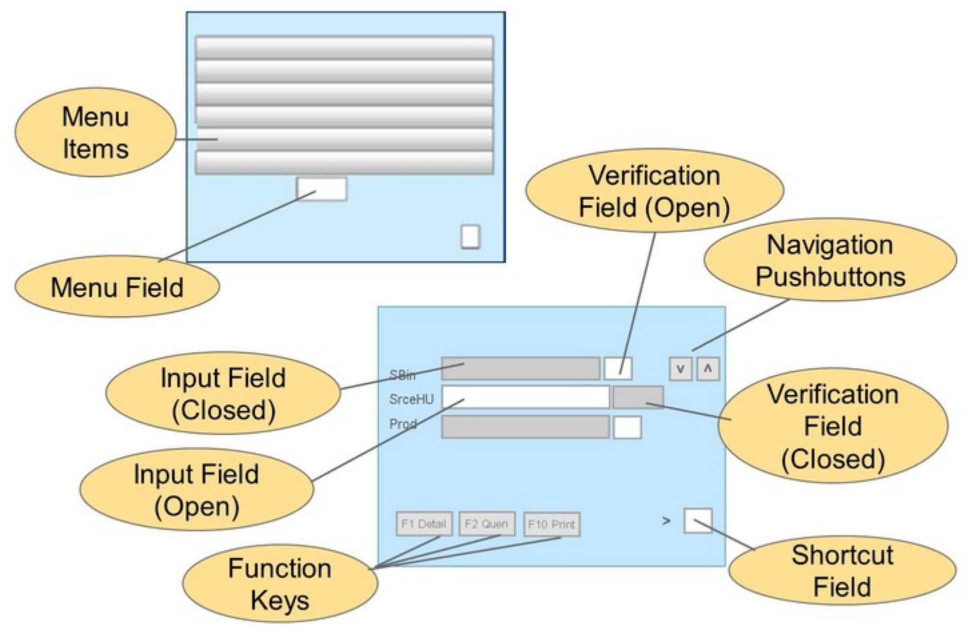

Figure 55: RF Screens

Transaction Navigation

When in the screen for a particular logical transaction, you may be required to enter data, validate existing data, or a combination of both.

When data entry is required, the input field is open. You enter the data by scanning bar codes or typing. If you enter data manually, you choose *Enter*.

After all input fields on the screen are filled, one of the following actions occurs:

- If the *Skip Shortcut* indicator is set, the posting (for example, WT confirmation) is triggered automatically.
- If the *Skip Shortcut* indicator is not set, you automatically navigate to the *Shortcut* field.

You can invoke functions by choosing the corresponding function key pushbutton, or entering the function key in the *Shortcut* field. Where necessary, you enter exception codes in the *Shortcut* field (for example, for differences).

RF Framework Settings

The following sections present the most important objects and settings in the RF framework: RF Screen Manager, Presentation Device, Presentation Profile, RF Menu Manager, and Wizards.

RF Screen Manager

The RF screen manager is a tool that enables you to customize the appearance of RF presentation screens, to ensure that they are consistent with the attributes of the presentation devices being used.

The RF screen manager also enables you to create, copy, and delete display profiles, and to edit screens of a display profile. The display profile is a group of settings that determine the appearance of RF presentation screens, including screen templates and the formats of screen elements.

Screen Display Characteristics

By defining your own display profiles, you can determine the following screen display characteristics:

- Screen size
- Screen element attributes, including:
    - Number of buttons available for the screen
    - Text length for buttons, logical transactions, and menu items
    - How messages are displayed
- Screen template function groups and screen numbers

The standard profile is ‘**’.

If you define your own display profile, you define height and width of your total screen (standard is 8x40) and the template program and screens (0001 and 0002 for messages). The length of the buttons, the number of buttons, the length of the menu items, the display of error messages (0 = display on a separate screen), and where the error messages are displayed is also defined at the profile level. You can use the three parameters BEEP_INFO, BEEP_WARN, and BEEP_ERR to maintain the number of beeps processed by the device when a message is displayed.

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- Screen template function groups and screen numbers

The standard profile is '**'.

If you define your own display profile, you define height and width of your total screen (standard is 8x40) and the template program and screens (0001 and 0002 for messages). The length of the buttons, the number of buttons, the length of the menu items, the display of error messages (0 = display on a separate screen), and where the error messages are displayed is also defined at the profile level. You can use the three parameters BEEP_INFO, BEEP_WARN, and BEEP_ERR to maintain the number of beeps processed by the device when a message is displayed.

> Note:
> ITSmobile also includes the “ITSmobile Visual Editor” , which enables you to edit screens and templates directly in SE80. For details, see SAP Note 1872180 - ITSmobile Visual Editor // Main Note //.

Presentation Device

Presentation devices classify the different kind of devices you use in your warehouse.

When defining a presentation device, you enter its characteristics, such as display profile, presentation device type, data entry type, function keys quantity, various indicators, and signal assignments.

The presentation devices can be assigned to a resource (which is part of resource management).

Presentation Profile

The presentation profile (together with the personalization profile) is used to support different menu structures for different users.

The presentation profile is assigned to the application (the standard application for SAP EWM is 01).

The **personalization profile** is used to enable the customer to make changes to the SAP standard. With the personalization profile you can support different user groups working in different menus and different processes. The standard personalization profile is ‘**’.

RF Menu Manager

With the RF menu manager, you can define your own menus.

First, you create your menu items for the main menu and the submenus. In the hierarchy, you define whether a logical transaction is triggered (field LTRANS) or if the user jumps to a submenu (field LMENU).

SAP delivers the default menu with application ‘01’, presentation profile ‘****’, and personalization profile ‘**’. These entries can only be maintained in an SAP system. In a customer system, these entries are locked for changes.

Wizards

There are two wizards available, which are started directly from a running RF transaction with Ctrl + Shift + F1.

Split Screen

This wizard guides you through the necessary steps to split the RF transaction screen into several screens. These screens are then displayed in your preferred sequence. You can also configure the function codes that are displayed in each resulting screen.

The Split Screen wizard includes the following steps:

- Assign fields to split screens
- Assign function codes to split screens / assignment
- Assign function codes to split screens / buttons
- Define target function group and screen numbers

- Define personalization profile
- Complete (creating the new screens and customizing in database)

Modify Screen

This wizard guides you through the necessary steps to modify an RF transaction screen. Each time you add or remove fields from the screen, the wizard generates an updated screen. To display the new screen to a specific group of users, enter the user's personalization profile, and the wizard automatically adjusts the Customizing. The new screen is displayed in Screen Painter, where you can adjust aspects of the screen layout, such as the position and field size.

The wizard contains the following steps:

- Select target screen fields
- Assign verification fields
- Define target function group and screen number
- Define personalization profile
- Complete (creating the new screens and customizing in database)

Pick by Voice

The pick by voice (PbV) functionality in SAP Extended Warehouse Management (EWM) supports voice-based picking and internal moves in the warehouse, independently of the RF picking transaction. It is based on the RF framework, the RF picking transaction, and the ITS template generator Mobile Devices with Speech Input. It supports bar code scanning and voice-enabling.

The pick by voice transaction uses SAPGUI Dynpros whose fields have speech properties. From these Dynpros, the system generates HTML templates using the ITS HTML template generator Mobile Device with Speech Input. These HTML templates contain speech-specific tags that are interpreted by the web browsers on the device.

The system interprets speech input either as a field input value or as a command. All possible commands must be visible on the screen and represented by a button. The RF framework supports up to 16 buttons. You cannot assign commands to function keys.

To trigger a command, you must switch to command mode by saying the built-in keyword “Command”. Alternatively, the system automatically goes into command mode if you make entries in all input fields.

Using the command “Okay” is equivalent to pressing Enter.

You can use the start transaction /SCWM/RFUI_PBV to start the RF framework, set a voice-enabling parameter, and start the PbV transaction directly. This transaction is not part of the *SAP Easy Access* screen. The Internet Communication Framework (ICF) service RFUI_PBV is linked to this start transaction.

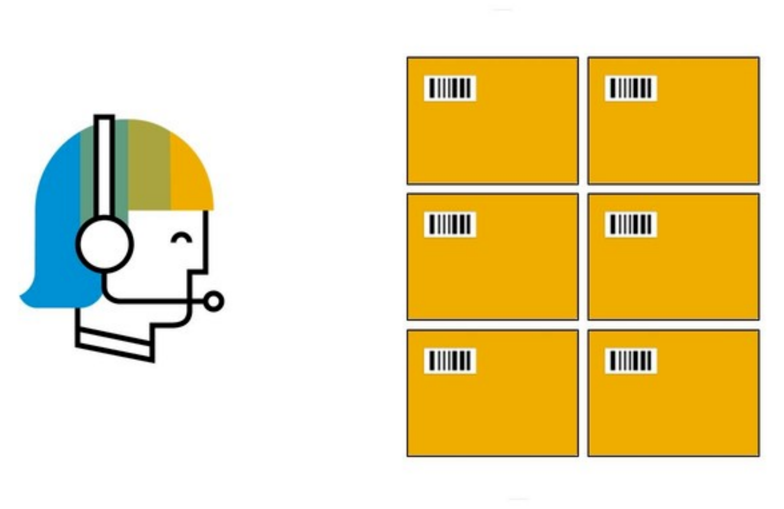


Figure 56: Pick By Voice

Asynchronous WT Confirmation and Pick-HU WT Creation

SAP EWM offers possibilities to improve performance during picking with RF. These are:

- Asynchronous Delivery Update.

  During pick warehouse task confirmation, the system also updates the corresponding outbound delivery order item. To improve the response time of the warehouse task confirmation step, the system can perform the delivery update asynchronously in a Remote Function Call (RFC) queue. You can activate asynchronous delivery update on the SAP Easy Access screen under *Extended Warehouse Management* → *Settings* → *Performance Settings* → *Activate Asynchronous Delivery Update* .

- Asynchronous Pick Warehouse Task Confirmation

  To improve the response time of the warehouse task confirmation step, you can activate asynchronous pick warehouse task confirmation. With asynchronous pick warehouse task confirmation, the system presents the next RF screen before updating the database. You can activate asynchronous pick warehouse task confirmation on the SAP Easy Access screen under *Extended Warehouse Management* → *Performance Settings* → *Activate Asynchronous RF Processing* . The asynchronous pick warehouse task confirmation can fail if, for example, the Customizing settings for the storage type allow the available quantity to be a negative value.

- Asynchronous Creation of Pick-Handing Unit Warehouse Tasks

  The system creates the pick-handling unit (pick-HU) warehouse task from the resource to the destination bin when confirming the first pick warehouse task into the HU. To improve the response time of the warehouse task confirmation step, the system creates the pick-HU warehouse tasks asynchronously in an RFC queue. The path is the same as that for the Asynchronous Pick Warehouse Task Confirmation.

> Note:
> Use asynchronous processing only when necessary as quicker response times increase system load, which can have a negative effect on the required system sizing.

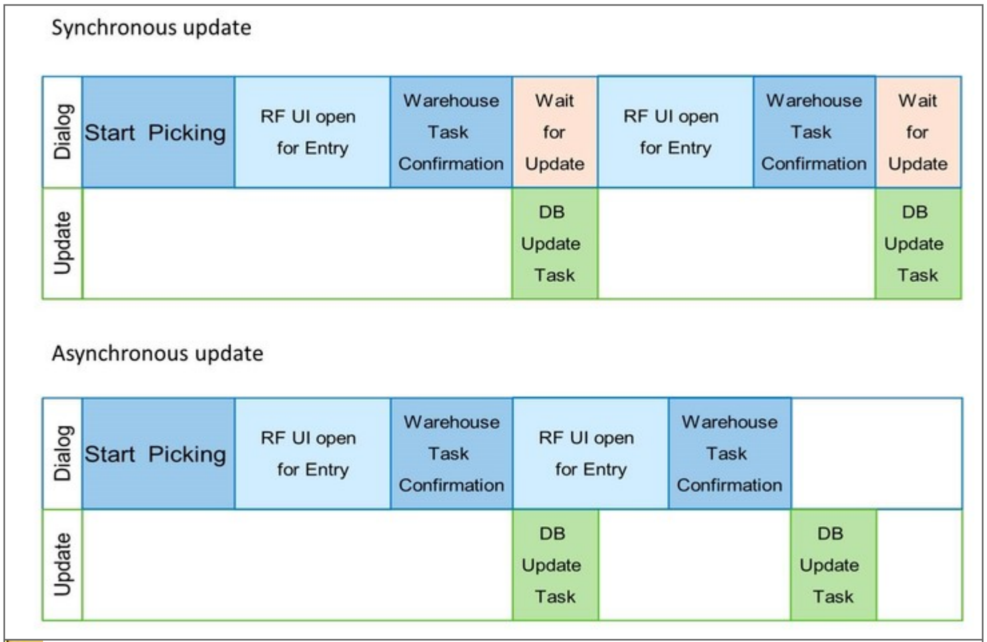


Figure 57: Synchronous vs. Asynchronous Warehouse Task Confirmation

Other Settings to Improve Performance

There are other settings available to improve RF performance:

- Switching Off Printing

  Warehouse task printing and HU printing are called during warehouse task creation and warehouse task confirmation. The function modules call the Post Processing Framework (PPF) which reads the relevant Customizing and calls the schedule condition for all active PPF actions. The schedule condition checks whether the warehouse process type or the packaging material type has a determination procedure from the assigned condition technique. If there is one, the condition technique is called, and based on the result, the system determines whether or not to print. If you know that you do not want printing as part of this process, you can control whether or not the PPF is called. You can set the value for the field *QUEUE_PRINT* in the queue definition. The resource has as similar field (*RSRC_PRINT*).

- Switching Off Messages

  With the RF framework, you can send messages from the warehouse management monitor to resources. However, checking for potential messages can consume system performance. Therefore, you can turn messaging off on the SAP Easy Access screen under *Extended Warehouse Management* → *Master Data* → *Resource Management* → *Deactivate Messages to Resources* .

Combining Warehouse Tasks

You can use **combined picking** in the radio frequency (RF) picking transaction to collectively pick warehouse tasks with the same attributes. By doing this, you can avoid the picker having to confirm the same source bin or source HU more than once during the processing of one warehouse order.

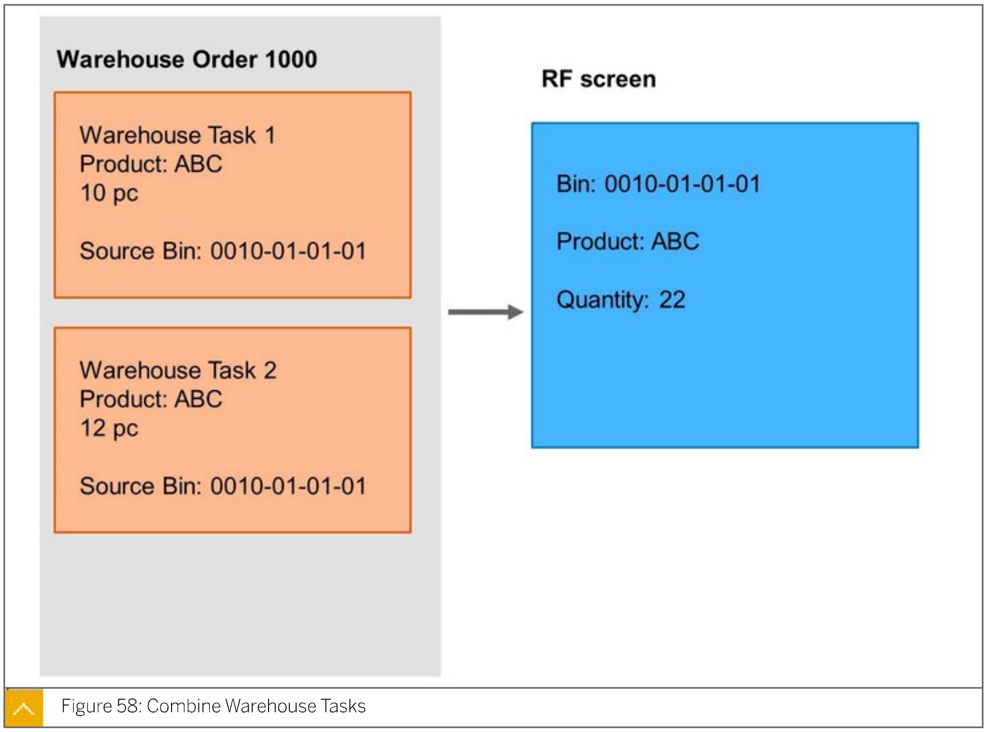


Figure 58: Combine Warehouse Tasks

The warehouse tasks can be combined if they have the following matching attributes:

- Warehouse task attributes:
    - Source bin
    - Source HU
    - Pick-HU
- Stock attributes:
    - Stock key, for example, product, batch, party entitled to dispose and so on
    - Alternative unit of measure
- Optional attributes:
    - Warehouse task consolidation group

Exception Handling

You can use the standard exception codes in the RF picking transaction. The exception codes are applied to the combined warehouse tasks.

- Exception codes such as BIDU or BIDF can be used for full denial of the combined quantity. The system applies the full denial to all the warehouse tasks that were combined.
- When the quantity in the storage bin is lower than the combined quantity and you still want to perform combined picking, you can use exception codes such as BIDP to distribute the partial quantity among the combined warehouse tasks.

  Example: You have three warehouse tasks for picking the same product from the same source location:

  - Warehouse task 1: To pick 10 pieces of product A
  - Warehouse task 2: To pick 8 pieces of product A
  - Warehouse task 3: To pick 5 pieces of product A

  A warehouse worker is asked to confirm the combined picking of 23 pieces of product A. However, there are only 15 pieces of product A in the source location. The warehouse worker can pick products even if the number of products is lower than the number specified in the system. The worker enters the BIDP exception code. The system performs the following pick confirmation:

  - Warehouse task 1: 10 pieces Full Pick
  - Warehouse task 2: 5 pieces Partial Pick
  - Warehouse task 3: 0 pieces Full Denial

  You can use the SPLT exception code to split the product quantity of the combined warehouse tasks into different quantities.

You can choose the F3 UnCom button to cancel the combination of warehouse tasks that were combined previously by the system.

LESSON SUMMARY

You should now be able to:

- Use mobile devices
- Optimize mobile device processing

Unit 5
Lesson 3

Managing Resources

LESSON OVERVIEW

In this lesson, you learn how to set up resources in SAP Extended Warehouse Management (EWM).

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Manage resources

Resources in EWM

A resource is an entity representing a user or equipment that can execute work in the warehouse.

It can log on to a radio frequency (RF) or non-RF environment. Once the resource is logged on to the system, it can receive work for execution and it can be tracked and displayed in the warehouse management monitor.

A resource belongs to a resource type (a grouping of resources with similar technical or physical qualifications) and a resource group (a grouping of resources for queue assignment purposes).

> Note:
> Although a resource can work in a non-RF environment, several features of working with resources are only available when using mobile devices.

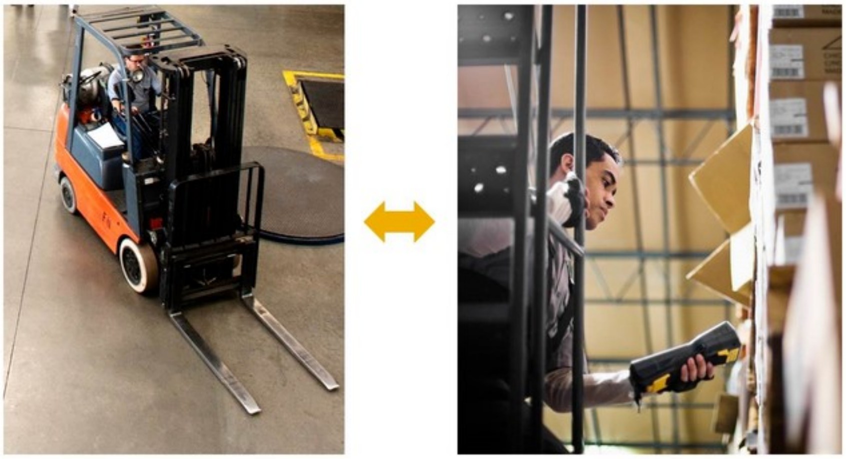


Figure 59: Resources In EWM

Resource Management

Resource managementmaximizes the efficiency of warehouse processes by:

- Facilitating the management and distribution of work using queues
- Enabling the execution of work by resources in an RF and non-RF environment
- Optimizing the selection of warehouse orders for resources requesting work
- Enabling effective monitoring and controlling of resources

Assignment of Warehouse Orders to a Resource

Warehouse Orders (WOs) can be assigned to resources in RF and non-RF environments.

In an RF environment, WOs can be assigned manually or automatically. In a non-RF environment, WOs are assigned manually.

For automatic WO assignment to a resource, the WOs must belong to a queue to which the resource is assigned.

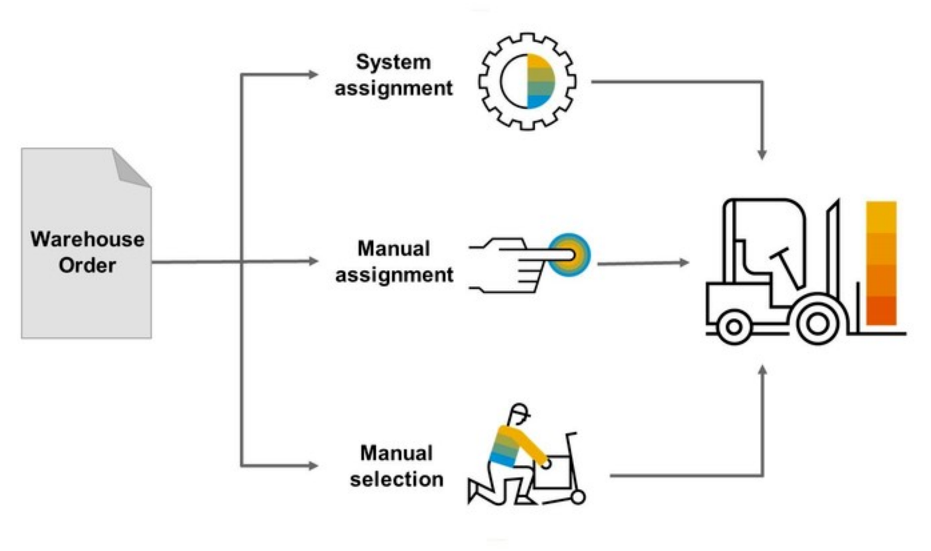


Figure 60: Assignment of Warehouse Orders to a Resource

Warehouse Order (WO) Assignment to a Resource

	Non-RF Environment	RF Environment
1	A resource logs on to the desktop environment.	A resource logs on to the RF environment
2	The warehouse manger assigns the WO to the resource using the *Assign Rsrce* monitor method.	One of the following occurs: • The warehouse manager assigns a WO to the resource using the *Assign Rsrce*
3	The warehouse manager prints out the WO and gives it to the resource.	

		warehouse management monitor method. • The resource requests work by choosing a system-guided option from the RF menu. In such a case, the system assigns the most appropriate WO to the resource. • The resource requests work by choosing a manual option from the RF menu (for example, Pick by HU). In such a case, the system assigns to the resource the specific WO.

Hint:
Any available WOs can be manually assigned to a resource, including those from queues to which the resource is not assigned.

Queues

A queue is a logical file to which warehouse orders for processing are assigned. Queues define movements by which work in the warehouse is managed and assigned.

The management and distribution of work in the warehouse is accomplished by the assignment of resources and WOs to queues. In addition, a resource working within a particular operating environment may execute only those WOs that belong to a queue in the same operating environment.

Note:
You determine the operating environment of a queue during queue definition in customizing. The operating environment of a resource is determined when the resource logs on to the RF or non-RF environment.

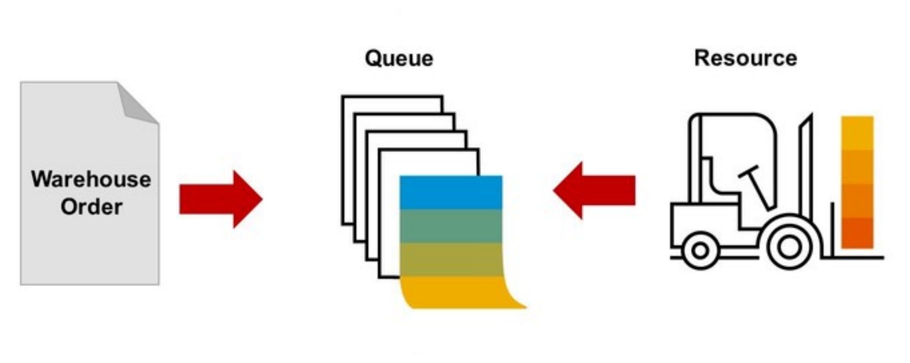


Figure 61: Queues

Assignment to Queues

Resource Assignment to Queue

You can assign a resource to a specific queue, or assign its resource group to a sequence of allowed queues. WO selection is performed first according to the resource's assigned queue, and, in the absence of an assigned queue, according to the resource group's queue sequence.

Warehouse Order Assignment to Queue

When the system creates a WT, it searches for an appropriate queue to assign to it, based on the following WT parameters:

- Source activity area
- Destination activity area
- Bin access type
- Warehouse process type
- Activity

Resource Setup

You define a resource in the transaction for resource maintenance. On the EWM *Index* screen, choose *Extended Warehouse Management* → *Master Data* → *Resource Management* → *Maintain Resource* .

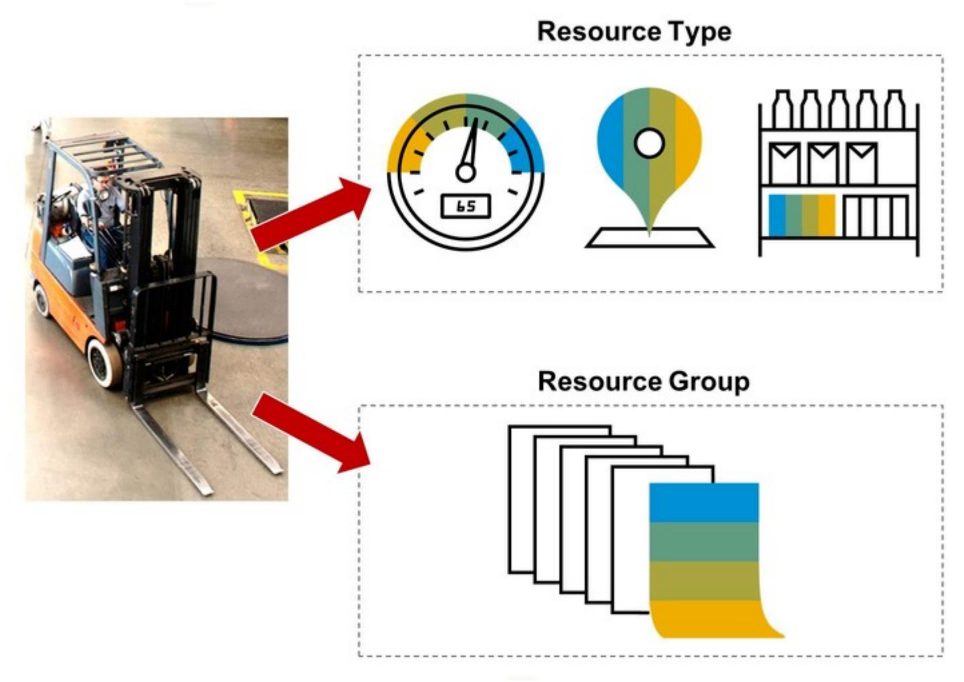


Figure 62: ResourceSetup_Image.ppt

Resource Type

A resource type is a grouping of resources with similar technical or physical qualifications.

The resource type determines the following for its corresponding resources:

- Horizontal and vertical velocity

  The velocity of a resource can influence the latest starting date (LSD) of a warehouse order.

- Applicability of position management

  Position management enables an RF device user to validate HUs by their position number, rather than by their HU number. This is particularly useful when the HU number tags are not readily accessible, such as when the HUs are stacked on top of each other.

- Qualifications and preferences (reflected by priority values) regarding **bin access types** and **HU type groups.**

Resource Group

A resource group is a grouping of resources for queue assignment purposes. The resource group determines the sequence of allowed queues for its corresponding resources, which can influence which warehouse orders are selected for a resource.

To use system-guided processing, the queues must be assigned to the resource groups in the desired sequence. As the WOs are selected from the queues according to the queue sequences, this represents a prioritization of the WOs for this resource type.

Resource Execution Constraints

Resource execution constraints allows you to control the number of working resources in defined areas of the warehouse. You define these areas by assigning a resource execution constraint (REC) storage group to your storage bins.

The individual REC storage groups can correspond to an aisle, storage section, storage type, or another area in your warehouse. You can define the maximum number of permitted work resources for these REC storage groups in such a way that the resources can perform your work without disruption.

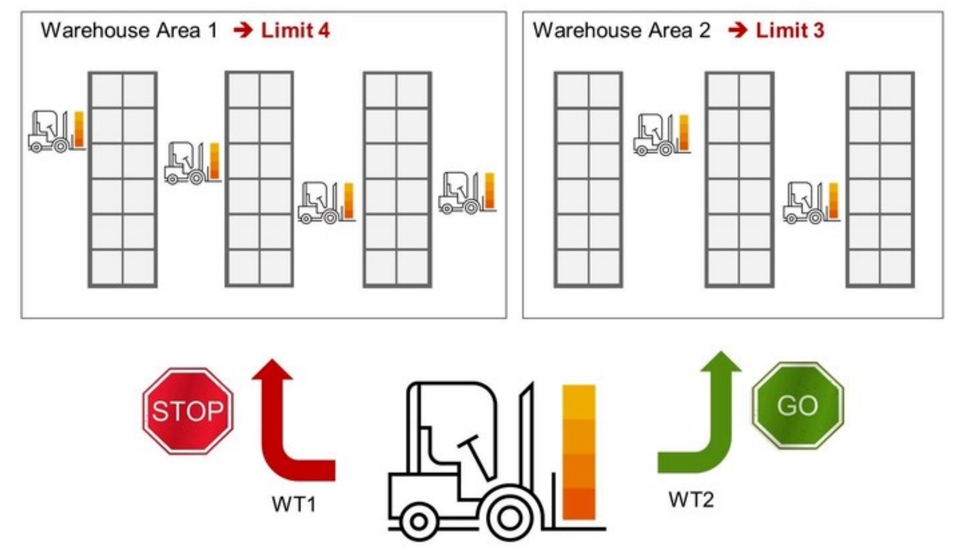


Figure 63: Resource Execution Constraints

Resource Types

The REC consists of a group of different resource types, each having a maximum number of work resources. You identify the group uniquely using an ID. You can assign the same ID to different REC storage groups, and define whether:

- Only one resource type is allowed to be kept in the REC storage group at a time (parameter OR).
- Multiple different resource types are allowed to be kept in the REC storage group at a time, for example, a forklift and a warehouse worker. For each resource type, the maximum defined number of work resources in the REC storage group is allowed (parameter AND).

For example, resource types RT01 and RT02 are assigned to resource execution constraint A1, with a maximum number of two and three respectively. REC storage group GAN is assigned to constraint A1 with the parameter "AND". This means that a maximum of three resources of type RT02 and two resources of type RT01 can work in A1 at the same time.

Calculated Times

The REC control is based on calculated times. Each time a resource enters the REC storage group, the system calculates the estimated exit time. This time includes the following:

- Move time for moving the resource from the current position to the entry point of the REC storage group
- Working time in the REC storage group
- Exit time of the resource from when it leaves the location of the last completed warehouse task to the exit point of the REC storage group

When a resource wants to enter the REC storage group, the system compares the estimated exit times of the resources working in this area with the entry time of the resource. The system calculates the times, compares the calculated values with the number of permitted resources, and allows or denies the resource access to the REC storage group.

The system calculates optimal routes for the resources based on the **travel distance calculation** The actual times may deviate from the optimal times.

This function works using the average confirmation time for warehouse tasks. If you have activated LM in your SAP EWM system, the system uses the engineered labor standard values. If you are not using LM, you must define the bin access type for the REC storage group in the master data and you must also define the **extract time determination**for storage bins.

LESSON SUMMARY

You should now be able to:

- Manage resources

Unit 5
Lesson 4

Optimizing Work of Resources

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up system-guided or semi-system-guided processes
- Set up task interleaving
- Optimize warehouse orders

System-guided Versus Semi-system-guided Work

You can use semi-system-guided processing within system-guided processing. This is useful for source storage bins that have more than one HU. In system-guided processing, the system proposes one particular HU to the user for processing. Finding this particular HU can prove time-consuming. If the source storage bin contains multiple HUs, it is more efficient if the system instructs the warehouse worker to go to a particular source storage bin and remove any HU.

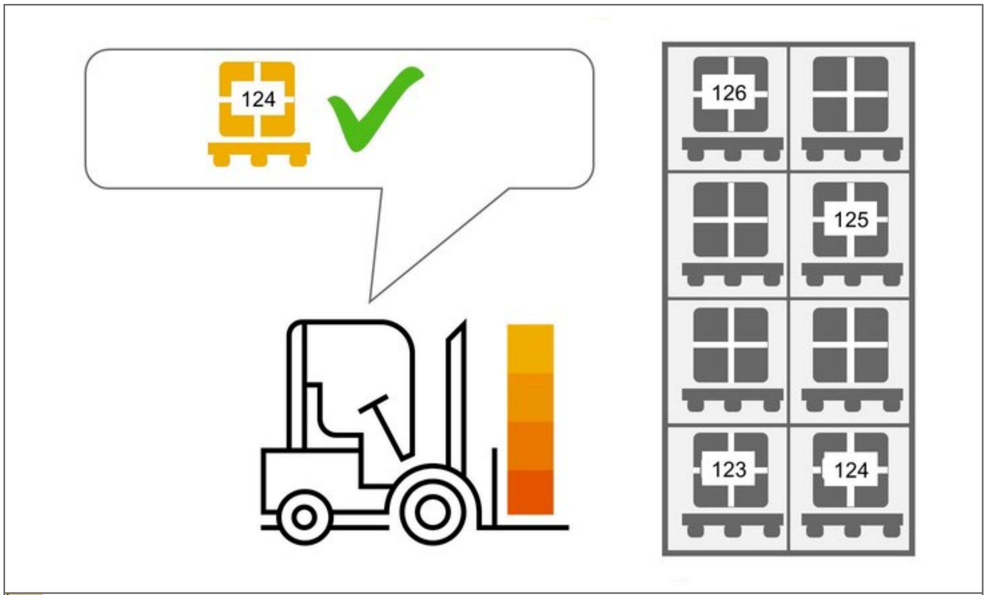


Figure 64: System-Guided and Semi-System-Guided Work

Semi-System-Guided Processing

To use this function, you set the queue to semi-system-guided processing. When selecting a WT, the system checks if a queue has been set to semi-system-guided processing. If it has, the system sets the session to semi-system-guided. This affects processing in the following ways:

- The user verifies the source storage bin only.
- The HU field is empty. The user can scan it.

After scanning, the system checks whether:

- The scanned HU is available in the specified storage bin.
- An open warehouse task exists for this HU.
- The reported resource is allowed to process the HU.

System-guided Processing	Semi-system-guided Processing
The screen shows you various data, such as HU, product, quantity, batch, and so on.	You only see the source storage bin and the input field for the HU.
The warehouse task is locked.	The warehouse task is not locked, because it is still not clear which HU is being selected.

The semi-system-guided processing screen contains a button that allows you to activate the display of available HUs. You can also trigger other queries for the HU, such as a queue or a storage bin.

Task Interleaving

The aim of task interleaving is to minimize unutilized resources through an optimized distribution of the warehouse tasks and to reduce the travel times in the warehouse. For example, after putaway, a forklift does not return empty to the goods receipt area. Instead, it is given a new task before returning to that area, such as a stock removal order.

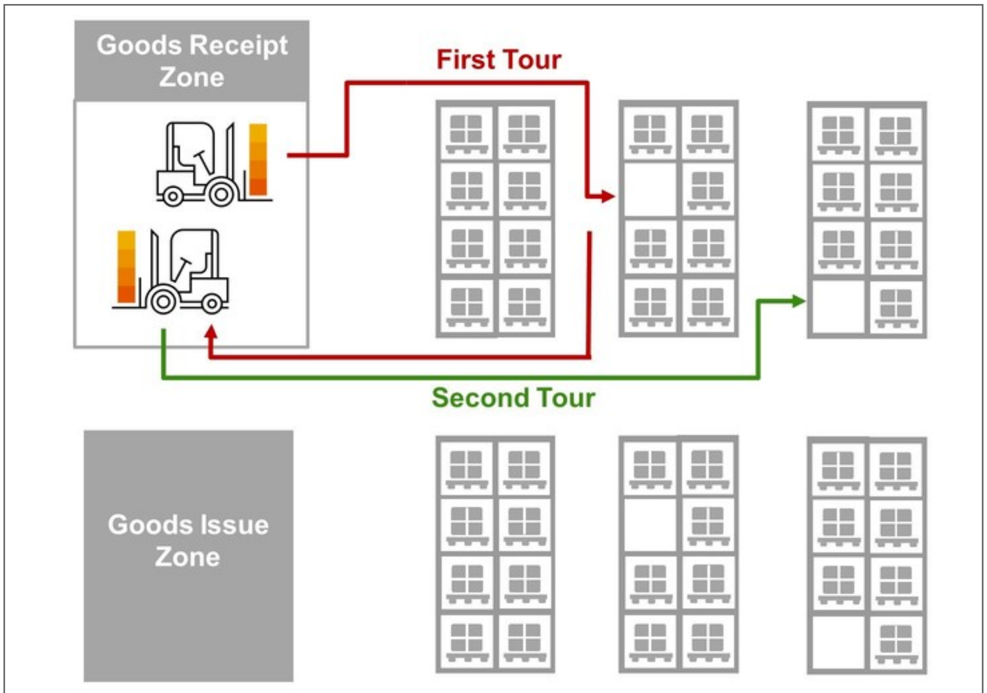


Figure 65: WithoutTaskInterleaving_Image.ppt

With Task Interleaving

After completing a WO, the system immediately assigns a new warehouse order to the warehouse worker, which is from a different queue.

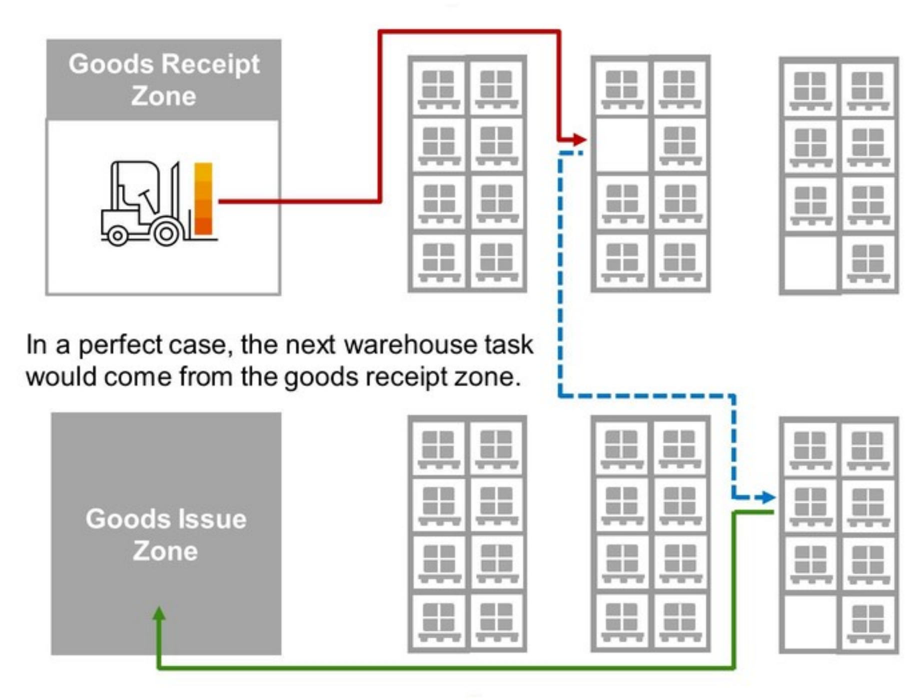

Goods Receipt Zone
In a perfect case, the next warehouse task would come from the goods receipt zone.
Goods Issue Zone

Figure 66: WithTaskInterleaving_Image.ppt

RF Interleaving

You set RF interleaving for resource types. You assign each interleaving-relevant queue to a queue type and to a queue sequence.

RF Interleaving	Standard RF Function
1. The resource processes a warehouse order of a queue.	1. The same queue is processed until it is empty.
2. The subsequent warehouse order comes from another queue, based on the defined queue type sequence.	2. The next queue is processed according to the defined queue sequence.

Caution:
This function is only available within system-guided processing.

Resource-Based Warehouse Order Optimization

When the system creates a warehouse order for warehouse tasks, it is not known yet which resource is process the warehouse order. This means that the limit parameters in the warehouse order creation rule must be modeled to fit the smallest resource of all the resources working in the same activity area. This leads to unsatisfactory assignments in other cases, where a resource, which can handle a bigger load or a higher number of HUs, is not fully used.

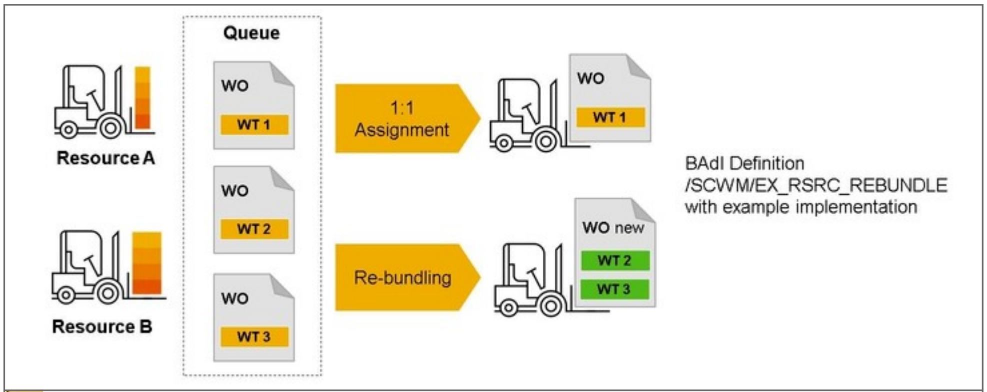


Figure 67: Resource-based Warehouse Order Optimization

The BAdI */SCWM/EX_RSRC_REBUNDLE* can be used to group warehouse tasks of existing warehouse orders into a new warehouse order to be processed next by a resource. The example implementation /SCWM/CL_EI_RSRC_REBUNDLE determines the capacity of a resource type and then the corresponding handling unit (HU) warehouse tasks that need to be grouped into new warehouse orders.

LESSON SUMMARY

You should now be able to:

- Set up system-guided or semi-system-guided processes
- Set up task interleaving
- Optimize warehouse orders

Unit 5
Lesson 5

Setting Up the Pick, Pack, and Pass Process

LESSON OVERVIEW

In this lesson you learn about the pick, pack, and pass process during picking. You learn about the features and requirements of the pick, pack, and pass function. You also learn about warehouse orders for pick, pack, and pass.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up the pick, pack, and pass process

Pick, Pack, and Pass During Picking

You use this function to coordinate picking, packing, and the transportation of products in different activity areas of your warehouse. For example, you transport products from one activity area to another using a conveyor. From an organizational point of view, an activity area can correspond to an aisle for which a warehouse worker is responsible. When the warehouse worker has picked a WO in an area, the goods are passed to the next area.

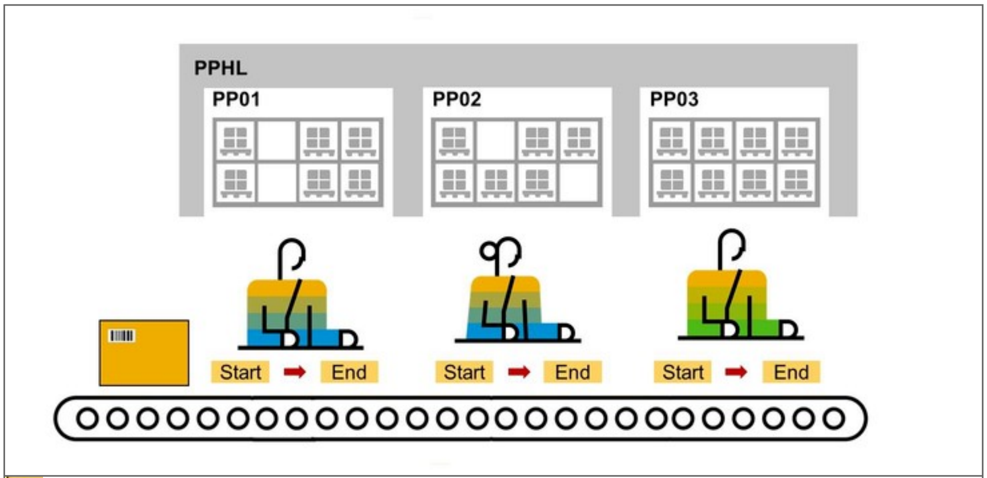


Figure 68: Pick Pack and Pass Process

The movement from one activity area to the other can be done by an automatic conveyor system. There may also be pick-to-light systems in the various zones to support the picking process within the zone.

Features of Pick, Pack, and Pass Function

You can use pick, pack, and pass only in an RF environment. The process flow is the same as for standard RF picking.

The destination storage bins are different when using pick, pack, and pass in comparison to standard RF picking. In pick, pack, and pass, warehouse workers pass the product from activity area to activity area until it arrives at the destination storage bin.

Picking	Destination Storage Bin
RF picking	A destination storage bin, such as goods issue area
RF picking using pick, pack, and pass	An end point of an activity area from where the product moves to the next activity area

You can use system-controlled pick, pack, and pass function or a user-controlled pick, pack, and pass function.

System-controlled Pick, Pack, and, Pass Function

With this setting, the system specifies the sequence for processing the WOs and corresponding pick HUs.

It creates a higher-level WO that contains all other WOs that have been created. Only the first WO in the sequence is active; all other WOs are inactive. The sequence in which the system orders the WOs corresponds to the sequence that you have defined in Customizing for the activity areas in the WO creation rules.

1. During WO creation, the pick HU determination determines the suitable pick HUs for all WTs of the WO.
2. The system checks the WO type. If you activated the pick, pack, and pass function, the system creates a higher-level WO that contains multiple WOs sorted by activity area. The system only passes on the standard WOs to resource management in SAP EWM.

User-controlled Pick, Pack, and Pass Function

With this setting, the system creates the WOs and the corresponding pick HUs the same as for the system-controlled pick, pack, and pass function. However, all created warehouse orders are active, and no sequence for processing them exists. The user takes a warehouse order that is valid for a specific activity area.

Requirements for Pick, Pack, and Pass

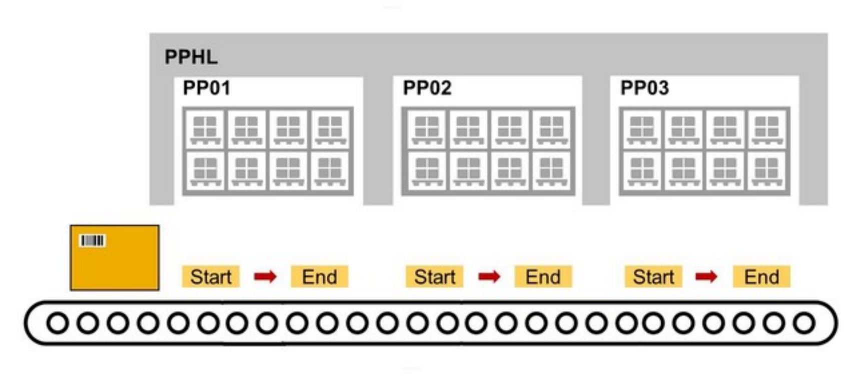


Figure 69: Activity Areas Start and End Points for Pick, Pack, and, Pass

Each picking zone must be mapped as an individual activity area. Additionally, the activity areas must be joined and for the system-driven option, they must be in the required sort sequence.

If you work with the system-driven method, you have to define which bins represent the start point and end point for each picking zone.

You need a WO creation rule that supports the top WO creation for the pick, pack, and pass process.

The creation categories for this are as follows:

- System-driven: The sequence of the WOs in the top WO is determined according to the sort sequence of the assigned in the configuration settings for joining the activity areas.
- User-driven: The sequence is manually determined during the execution, which means it can also be done by the material flow system (MFS).

Warehouse Orders for Pick, Pack, and Pass

If you use pick, pack, and pass, the system creates a higher-level WO that contains the pick HUs for all WTs that are to be created, which you pick one after the other. The warehouse worker also receives the WO created for an activity area, together with its warehouse tasks.

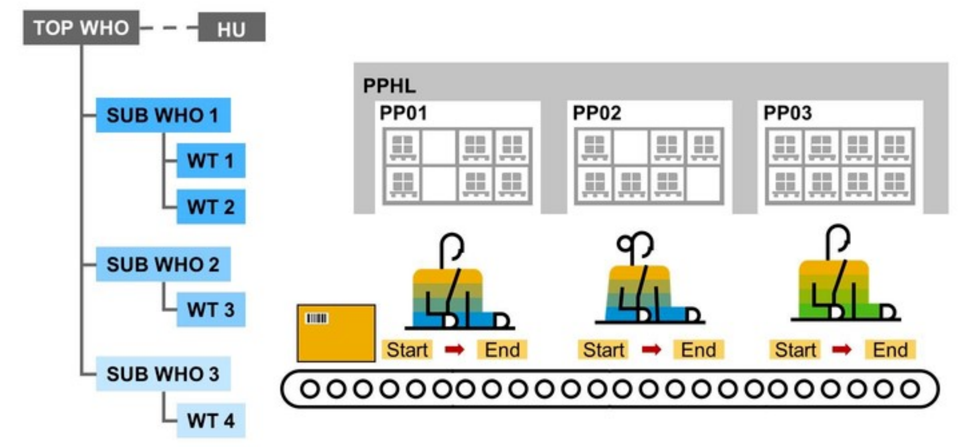


Figure 70: Warehouse Orders for Pick Pack and Pass

Warehouse Scenario

The warehouse workers pick in the three activity areas PP01, PP02, and PP03 in a system-controlled way using pick, pack, and pass.

1. The system creates a higher-level warehouse order containing several warehouse tasks for the three activity areas PP01, PP02, and PP03, and determines the pick HUs for all warehouse tasks.
2. It then distributes the warehouse tasks across the three activity areas.
3. Each of the three warehouse workers receives their own warehouse order.
4. The first warehouse worker takes the pick HU from the start point of the first activity area.
5. The worker performs picking and drops the pick HU at the end point of the activity area.

6. The pick HU is moved from the end point of the activity area to the start point of the next activity area.
7. The process is repeated from step 4. When it comes to the final activity area (PP03), the worker puts the pick HU in the original destination bin, such as the goods issue area, instead of in the end point of the activity area.

> Note:
> Usually, you would not want the worker from the last activity area to move to the goods issue area, the worker should also drop the pick HU at the end point. To achieve this, you would use layout-oriented storage control.

LESSON SUMMARY

You should now be able to:

- Set up the pick, pack, and pass process

Unit 5

Learning Assessment

1. What two methods does EWM use to calculate the travel distance?

____

____

____

2. The SAP RF framework offers which of the following RF functionalities?

   Choose the correct answers.

   ☐ A Work execution transactions for warehouse processes

   ☐ B Split screen

   ☐ C Logon

   ☐ D Log off

   ☐ E Recovery

3. WOs can be assigned to resources only in non-RF environments.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

4. When working with semi-system-guided queues, after scanning the system checks which of the following?

   Choose the correct answers.

   ☐ A The scanned HU is available in the specified storage bin

   ☐ B The HU field is empty

   ☐ C An open warehouse task exists for this HU

   ☐ D The reported resource is allowed to process the HU

Unit 5

Learning Assessment

1. What two methods does EWM use to calculate the travel distance?

___

___

___

2. The SAP RF framework offers which of the following RF functionalities?

Choose the correct answers.

☐ A Work execution transactions for warehouse processes

☐ B Split screen

☐ C Logon

☐ D Log off

☐ E Recovery

3. WOs can be assigned to resources only in non-RF environments.

Determine whether this statement is true or false.

☐ True

☐ False

4. When working with semi-system-guided queues, after scanning the system checks which of the following?

Choose the correct answers.

☐ A The scanned HU is available in the specified storage bin

☐ B The HU field is empty

☐ C An open warehouse task exists for this HU

☐ D The reported resource is allowed to process the HU

5. What is the function of task interleaving?

____

____

____

6. What are the requirements for pick, pack, and pass?

Choose the correct answers.

☐ A A WO creation rule

☐ B Queue types

☐ C Define which bins represent the start point and end point for each picking zone

☐ D Each picking zone must be mapped as an individual activity area

Unit 5

Learning Assessment - Answers

1. What two methods does EWM use to calculate the travel distance?

   Direct distance and distance based on networks.

   That is correct.SAP EWM uses the direct distance and distance based on networks to calculate the travel distance.

2. The SAP RF framework offers which of the following RF functionalities?

   Choose the correct answers.

   ☒ A Work execution transactions for warehouse processes

   ☐ B Split screen

   ☒ C Logon

   ☒ D Log off

   ☒ E Recovery

   That is correct. In the SAP RF framework, you can use work execution transactions for warehouse processes and use the logon, log off, and recovery function.

3. WOs can be assigned to resources only in non-RF environments.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

   That is correct. WOs can be assigned to resources in RF and non-RF environments.

4. When working with semi-system-guided queues, after scanning the system checks which of the following?

   Choose the correct answers.

   ☒ A The scanned HU is available in the specified storage bin

   ☐ B The HU field is empty

   ☒ C An open warehouse task exists for this HU

   ☒ D The reported resource is allowed to process the HU

5. What is the function of task interleaving?

   The aim of task interleaving is to minimize unutilized resources through an optimized distribution of the warehouse tasks and to reduce the travel times in the warehouse.

6. What are the requirements for pick, pack, and pass?

   Choose the correct answers.

   ☒ A A WO creation rule

   ☐ B Queue types

   ☒ C Define which bins represent the start point and end point for each picking zone

   ☒ D Each picking zone must be mapped as an individual activity area

UNIT 6

Control of Physical Movements in the Warehouse

Lesson 1

Setting Up Layout-Oriented Storage Control 129

Lesson 2

Integrating a Material Flow System 133

UNIT OBJECTIVES

- Set up layout-oriented storage control
- Set up a basic material flow system scenario

Unit 6
Lesson 1

Setting Up Layout-Oriented Storage Control

LESSON OVERVIEW

In this lesson, you will learn about the set up and usage of layout-oriented storage control. This lesson guides you through the complete process for layout-oriented storage control.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up layout-oriented storage control

Layout-oriented Storage Control

You can use the layout-oriented storage control if stock movements in your warehouse do not travel from a source storage bin to a destination location directly, but instead travel through an intermediate storage bin.

Layout-oriented storage control can occur due to the physical layout of your warehouse or when you have certain resources that only move in specific parts of your warehouse. In the case of automated storage and retrieval systems, you need **identification points** and **pick points** to connect these systems to the rest of your warehouse. In SAP EWM, you use the layout-oriented storage control to describe these intermediate storage bins.

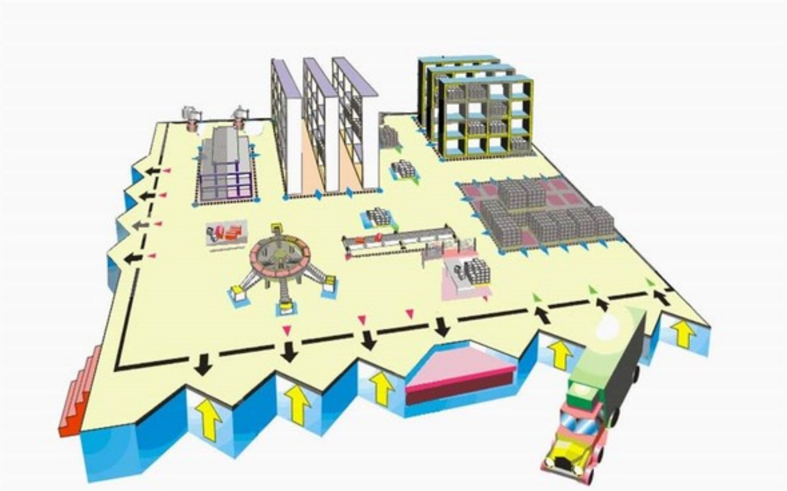


Figure 71: Complex Warehouses - Layout-oriented Storage Control

Layout-oriented storage control can only be used with handling units except when pick or identification points are used.

Layout-oriented Storage Control Setup

First, you define the **storage groups**. The storage group for layout-oriented storage control is a logical or physical breakdown of a storage type. Within a storage type, you can combine a series of storage bins for an area. The criteria for doing this should depend on the physics of the storage bin. For example, all storage bins in an aisle are grouped in a storage group, since the goods have to be brought during picking from this aisle to an intermediate storage bin at the end of the aisle.

In the settings for the layout-oriented storage control, an intermediate storage type is assigned for each required source or destination storage type or storage group. You can also choose an intermediate storage section or enter an intermediate storage bin. You can use this to specify in more detail where the product should be moved to. If you do not enter an intermediate storage section or bin, SAP EWM uses the defined putaway strategies to find the necessary data. Additionally, you can choose a **handling unit type group** to specify that a certain handling unit type, for example wire baskets, should always be moved using a specific intermediate storage type.

You also choose the warehouse process type that should be used to create the warehouse task to the intermediate storage type. You use this to specify which activities should be performed during warehouse task processing (for example, whether replenishment should be triggered automatically, or whether the quantities should be rounded). If the intermediate storage type is an identification point, the system does not use the warehouse process type.

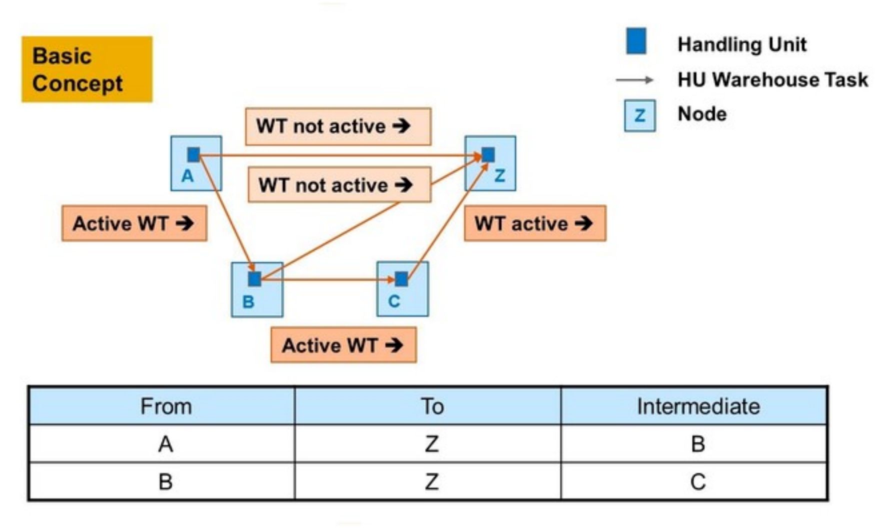
Access Strategy Storage Control

Below is the matrix for the access strategy of determining the interim storage types.

Access	*Source Storage Type*	*Source Storage Group*	*Destination Storage Type*	*Destination Storage Group*	*HU Type Group*	*Whole HU*
01	X	X	X	X	X	X
02	X	X	X	X	X	
03	X	X	X	X		X
04	X	X	X	X		
05	X	X	X		X	X
06	X	X	X		X	
07	X	X	X			X
08	X	X	X			
09	X		X	X	X	X
10	X		X	X	X	
11	X		X	X		X
12	X		X	X		
13	X		X		X	X
14	X		X		X	
15	X		X			X
16	X		X			

Access	*Source Storage Type*	*Source Storage Group*	*Destination Storage Type*	*Destination Storage Group*	*HU Type Group*	*Whole HU*
17	X	X			X	X
18	X	X			X	
19	X	X				X
20	X	X				
21	X				X	X
22	X				X	
23	X					X
24	X					
25			X	X	X	X
26			X	X	X	
27			X	X		X
28			X	X		
29			X		X	X
30			X		X	
31			X			X
32			X			
33					X	X
34					X	
35						X

Usage of Layout-oriented Storage Control



From	To	Intermediate
A	Z	B
B	Z	C

Figure 72: Layout-oriented Storage Control for HU Moves

In the figure, Layout-oriented Storage Control for HU Moves, a product pallet is to be moved from storage area A (goods receiving area) to storage bin Z (high-rack storage area). The high-rack storage area is on the second level of the warehouse. The system should execute a contour and weight check at the ID point B, to ensure that the product pallet can be put away in the high-rack storage area safely. For this activity, using layout-oriented storage control, the system determines that an interim move is relevant for a WT.

Here, the task to move from the HU from A to Z cannot be completed. Therefore, SAP EWM, based on layout-oriented storage control, creates a task to move the HU to the ID-point B. After the contour and weight check, the HU cannot be moved directly to Storage Type Z because it is on the second floor and requires special handling by the warehouse elevator. Now, based on layout-oriented storage control, an additional WT is created to move from identification point B to the warehouse elevator area C. When this task is confirmed, the source in the original WT is correctly updated according to the current source of the product, which is point C, and the original WT is activated. The product is then moved to the storage bin in storage type Z.

LESSON SUMMARY

You should now be able to:

- Set up layout-oriented storage control

Unit 6
Lesson 2

Integrating a Material Flow System

LESSON OVERVIEW

In this lesson, you learn about the functions and structure of a material flow system. You are also shown how to set up and integrate a material flow system.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Set up a basic material flow system scenario

Material Flow System

The material flow system (MFS) enables you to connect an automatic warehouse to SAP EWM without the need for an additional warehouse control unit. SAP EWM communicates directly with the control level.

You can set up the MFS in such a way that WTs (from an identification point to a storage bin in an automatic high-rack storage area, for example) are subdivided into smaller tasks. These are passed on, step by step, to the programmable logic controller (PLC) responsible in each case using telegram communication. The putaway and removal from storage of HUs can then proceed without the use of another software system.

You can define capacity limits for communication points, conveyor segments, or resources. The SAP EWM system then holds back tasks for the PLC as soon as these limits are exceeded. The same applies if the PLC reports that one of the individual elements of conveyance (vehicles, legs, or communication points) are subject to malfunction.

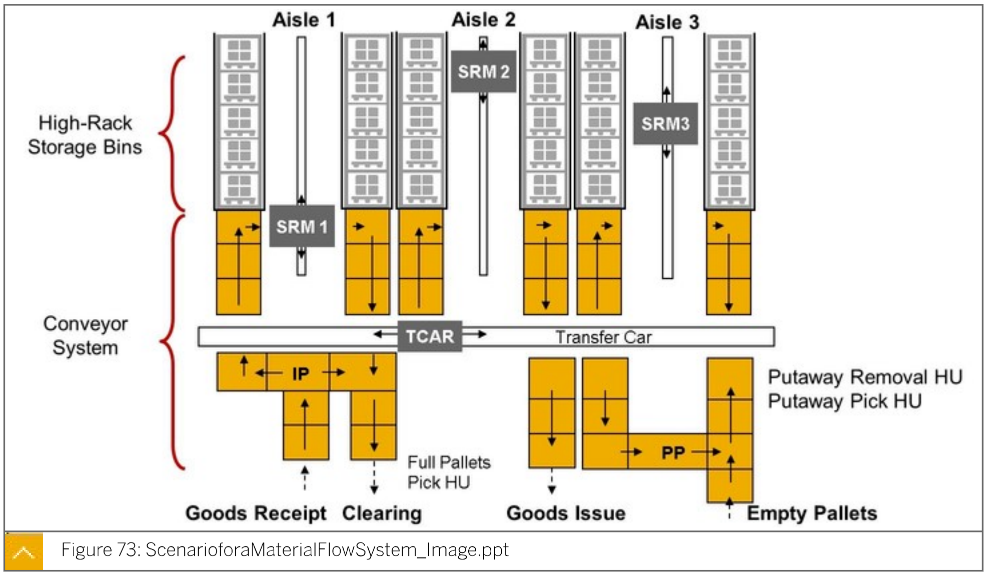


Figure 73: ScenarioforaMaterialFlowSystem_Image.ppt

Besides dispensing with an additional software system, this offers a close connection between the material flow and warehouse management. Therefore, warehouse management system strategies can be adjusted to the condition and utilization of automatic storage retrieval more efficiently. Additionally, the system provides the material flow system with functions and data, for example, for destination inquiries. In this way, system mapping accurately represents physical movements in the warehouse.

MFS Functions in an Automatic Warehouse

If you use SAP EWM to manage an automatic warehouse, you can use the following functions:

- Configurable **paths** through storage control
- Automatic **identification** of HUs using scanners on the automatic storage retrieval facility
- Automatic **diversion** of HUs that cannot be stored (incorrect contours, excessive weight, unidentified)
- Full automatic putaway of HUs in the storage bin using any number of interim steps; these interim steps are represented by **communication points**
- **Malfunctions** reported by the controls taken into account
- Configurable **capacity limits** for communication points, conveyor segments, and vehicles taken into account
- Reduction in empty traveling paths for stacker cranes through **interleaving**
- **Goods-to-man** picking principle
- **Stocks** are also available for deliveries during transportation within the system
- Stable **telegram communication** between EWM and PLC using parallel, bidirectional communication channels
- **Monitoring** and **troubleshooting** as part of the regular warehouse management monitor

Logical System Levels

In automatic warehouses, various types of technology are used including the following:

- Conveyor lines (belts, chain conveyors, roller conveyors) for containers, boxes, pallets, wire baskets
- Stacker cranes for accessing storage bins without a driver
- Transfer cars for moving storage units (handling units) horizontally to different leg stages or buffer spaces
- Scanners, sensors for contour control, scales

Programmable Logic Controller

These devices are usually controlled by means of a real-time system, called a programmable logic controller (PLC) that monitors and switches the sensors and actuators (light barriers, switches, motors, and so on). These real-time systems obtain their orders from the superordinate warehouse control level, which derives them from the warehouse requests.

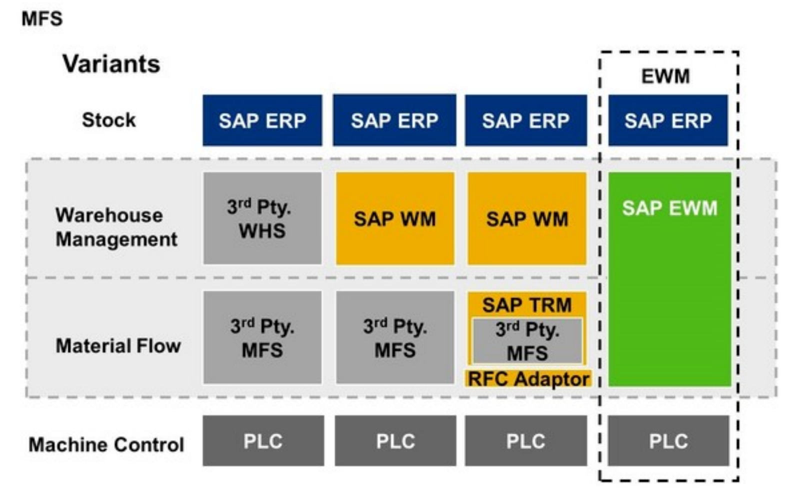


Figure 74: Communication to Programmable Logic Controller

> Note:
> In previous SAP EWM releases, an additional RFC Adaptor was required for the TCP communication. Since EWM 9.4, you can use the ABAP Push Channel TCP socket communication layer of SAP NetWeaver to communicate directly between SAP EWM and programmable logic controllers (PLCs).

Differences Between Automated Warehouse and Manual or RF-operated Warehouse

The following differences exist between automated warehouses and warehouses operated manually or by radio frequency:

- The resources are passive (as in the case of stacker cranes).
- Capacity bottlenecks must be watched and controlled much more closely.
- Technical malfunctions must be taken into consideration.
- Logistical malfunctions must not block the material flow (for example, bin occupied or unknown HU on automatic storage retrieval system).

Structure of a Material Flow System

This sample warehouse consists of an automatic high-rack storage area with three aisles and automated putaway and removal. A distribution trolley links the putaway and picking area with the high-rack storage area.

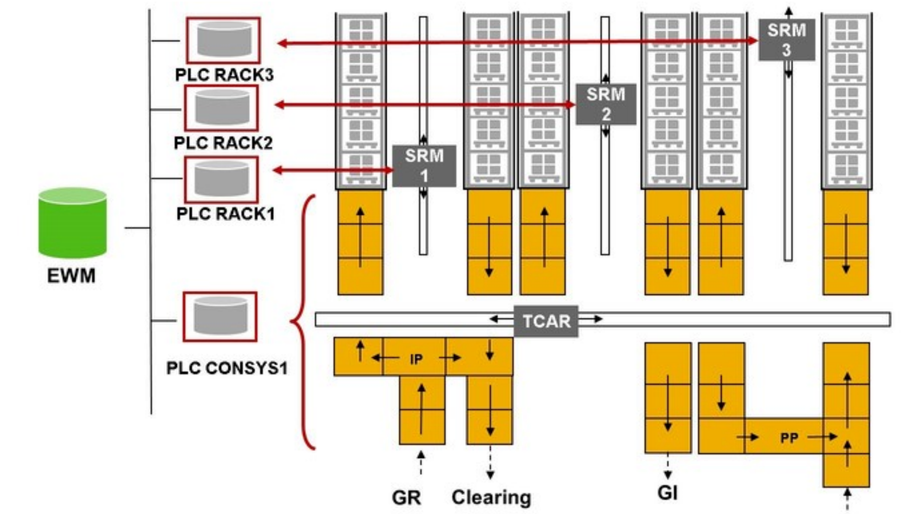


Figure 75: MFS Components

From the MFS perspective, this warehouse is operated with four controls. Three are for the stacker cranes and one is for the distribution trolley and the conveyor lines of the preliminary (pre-storage) zone. The warehouse has a single depth, and the distribution trolley and stacker cranes each have just one load-handling attachment.

MFS Components

In the MFS, the warehouse to be controlled is mapped via the following components:

- Programmable logic controller (PLC)

  The PLC is the underlying real-time system controlling the physical transportation of HUs on conveyor systems and their components. It evaluates signals from the connected automatic storage retrieval or conveyor system, or other controls, and activates or deactivates motors, appliances, sensors, readers, and so on. Each control that communicates with the SAP EWM system must be defined as a PLC. In larger installations, **head controls**may be in use, which regulate local controls. The SAP EWM system communicates with the head controls, so in that scenario you only define the head controls.

  At least one communication channel must be defined for each PLC.

- Communication channel

  The communication channel is the connection for transmission of messages between MFS and a control facility, defined by an IP address and a port. You also define certain properties, such as the length of the messages and whether telegram confirmations are to be used. Using the application menu, you also create the settings for the IP address and the port through which the PLC can be reached. You can use several channels to communicate with the same PLC. Each of these must use a separate port. You can specify that certain telegrams are to be sent on a particular port and other messages on a different port. Messages from a communication channel are communicated sequentially. One communication channel per control is sufficient.

Further MFS Components

Communication Points

SAP EWM maps the system to be controlled by means of communication points. Communication points are stations in the automatic storage retrieval system at which SAP EWM communicates with the PLC. Here, the PLC registers HUs (on the basis of scanner information or material flow tracking) and awaits new destination specifications. More communication points lead to closer material flow tracking in SAP EWM, but also to more intensive communication and consequently more load on the SAP EWM system. For each stage between communication points, a warehouse task is created. Every communication point is also a storage bin, but only the storage bins on the automated storage retrieval system are also communication points, whereas the storage bins in the actual warehouse are not.

Conveyor segments

Conveyor segments physically transport handling units (HUs) from one communication point to the next. You can define a capacity limit for conveyor segments. As in the case of communication points, the capacity relates to the number of HUs that can simultaneously be transported using the relevant conveyor segment. If the capacity of a conveyor segment is full, SAP EWM restricts further orders. You assign conveyor segments to your start and end points in layout-oriented storage control. You can combine different conveyor segments to form a conveyor segment group by conveyor segment group type (such as status). For example, you can assign an exception to the entire conveyor segment group rather than individual conveyor segments in the case of a malfunction report. The system then holds back orders for these conveyor segments. You only need to define conveyor segments if you want to check their status (readiness, capacity) in SAP EWM. In many cases, it is enough to record capacity and status at communication points.

Resources

In the MFS, a resource is a vehicle that transports an HU from one communication point (or storage bin) to another. A resource moves to the pickup point in an empty state, takes on the load, and then discharges the load at its destination. To reduce the number of empty travel paths, you must optimize the sequence of the orders.

SAP EWM contains an interleaving strategy for stacker cranes with:

- Just one load handling attachment (which means that only one HU can be loaded)
- Putaway and removal bin at the same end of the aisle
- To optimize the movements of stacker cranes from within SAP EWM, the stacker cranes must be mapped in SAP EWM as resources. Conveyor lines are not mapped as resources. To transport HUs, SAP EWM generates WTs and WOs and arranges them in queues. In the MFS, each warehouse order is assigned one WT only. To execute warehouse tasks, the SAP EWM system generates telegrams and sends these to the appropriate PLC.

MFS for Case Conveyor Systems

For systems such as those described above, the routing of the MFS movements is done using the layout oriented storage control and creates warehouse tasks for every single movement. With MFS for case conveyor systems, SAP EWM offers routing decisions based on the current location of a handling unit (HU) and context information related to the HU (such as general information regarding putaway or picking destination data).

Handling unit (HU) movements in MFS for case conveyor systems are not immediately modeled as warehouse tasks. Instead, the initial routing decision is made based on HU information, location information, and warehouse tasks or warehouse orders that might exist for final putaway or picking. As a result, a telegram is created and sent to the PLC. This telegram has no direct connection to a warehouse task. Nevertheless, the HU movement, which is based on the routing decision, can be modeled as a warehouse task in the system. You can do this in the following ways:

- The PLC executes the movement after it receives the routing decision from the EWM system. After this, it sends a new telegram with the actual routing information for the HU to EWM. EWM creates a warehouse task for this movement. This warehouse task is immediately confirmed.
- If the PLC is not able to send the actual routing information for the HU to EWM, it can trigger an asynchronous posting to the location of the routing decision.

Case conveyor systems use a different routing logic to other conveyor systems, which use layout-oriented storage control. With this routing logic you can enter different destinations for the following:

- Activity areas
- HUs without an MFS error
- HUs with an MFS error
- Empty HUs without a warehouse order (WO) or warehouse task (WT)
- HUs containing content without a WO or WT
- HUs that do not fit any of the pervious criteria

  In this case, you can specify a default direction. The system uses the default direction if no appropriate entry has been customized. For example, two entries have been customized, one for HUs without an error and one default. If a HU has an error or no WT exists, the system chooses the default entry.

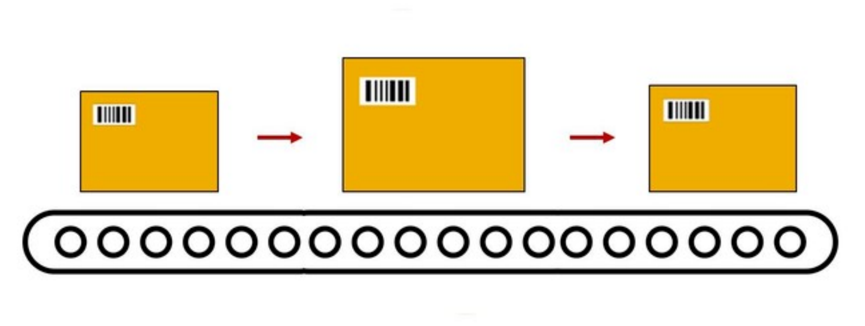


Figure 76: MFS Case Conveyor Systems

LESSON SUMMARY

You should now be able to:

- Set up a basic material flow system scenario

Unit 6

Learning Assessment

1. How do you set up layout-oriented control?

   Arrange these steps into the correct sequence.

   ☐ Assign an intermediate storage type.

   ☐ Define the storage groups.

   ☐ Choose the warehouse process type that should be used to create the warehouse task to the intermediate storage type.

2. In the MFS, the warehouse can be mapped via which of the following components?

   Choose the correct answers.

   ☐ A Conveyor segment

   ☐ B Conveyor line

   ☐ C Communication channel

   ☐ D Communication point

Unit 6

Learning Assessment - Answers

1. How do you set up layout-oriented control?

   Arrange these steps into the correct sequence.

   \boxed{2} Assign an intermediate storage type.

   \boxed{1} Define the storage groups.

   \boxed{3} Choose the warehouse process type that should be used to create the warehouse task to the intermediate storage type.

2. In the MFS, the warehouse can be mapped via which of the following components?

   Choose the correct answers.

   ☒ A Conveyor segment

   ☐ B Conveyor line

   ☒ C Communication channel

   ☒ D Communication point

UNIT 7

Extension of Work with Special Products

Lesson 1

Using Serial Numbers 142

Lesson 2

Kitting in EWM 147

UNIT OBJECTIVES

- Work with serial numbers
- Describe the different kitting scenarios
- Set up a kit-to-stock process

Unit 7
Lesson 1

Using Serial Numbers

LESSON OVERVIEW

In this lesson, you learn about working with serial numbers. You also examine the three different types of serial number requirements. Serial number profiles and the usage of serial numbers in the delivery are also covered.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Work with serial numbers

Serial Numbers

A serial number is a character string that is given to a product in addition to a product number to differentiate the individual piece from all the other pieces.

The combination of product number and serial number is unique.

You use serial numbers if you want to identify or trace single units in the warehouse. SAP Extended Warehouse Management (EWM) only controls the serial numbers (as a movement date) until goods issue posting. This can help you to identify a product uniquely and to provide your with an overview of which products you have sold to which customers.

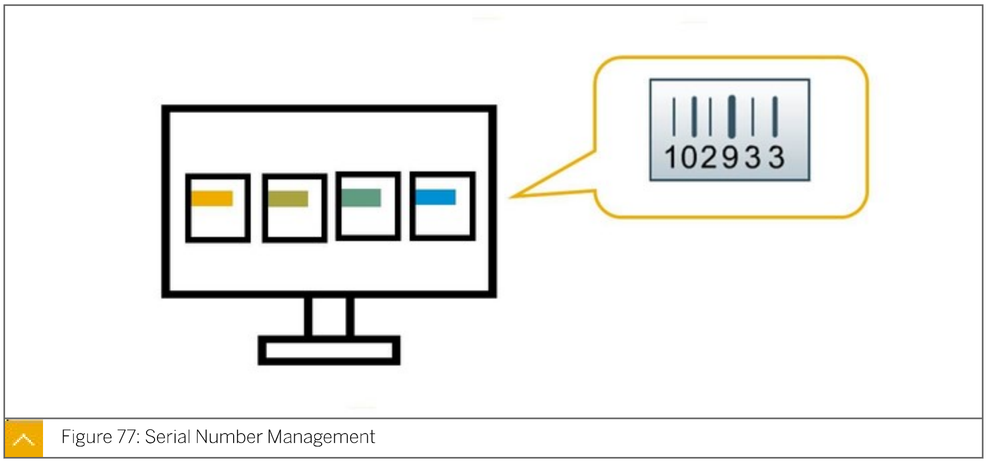


Figure 77: Serial Number Management

Serial Number Requirement Level

In SAP EWM, there are three different types of serial number requirements:

- Serial numbers for document items
- Serial numbers at warehouse number level

- Serial numbers in inventory management

Each serial number requirement gives you different levels of detailed information about the serial number, but also affects the processes in the warehouse.

Note that it is not possible to simply change the serial number requirement for product if you have or ever had stock of this product in a warehouse. The SAP note 1498521 describes the necessary steps if such a change is required.

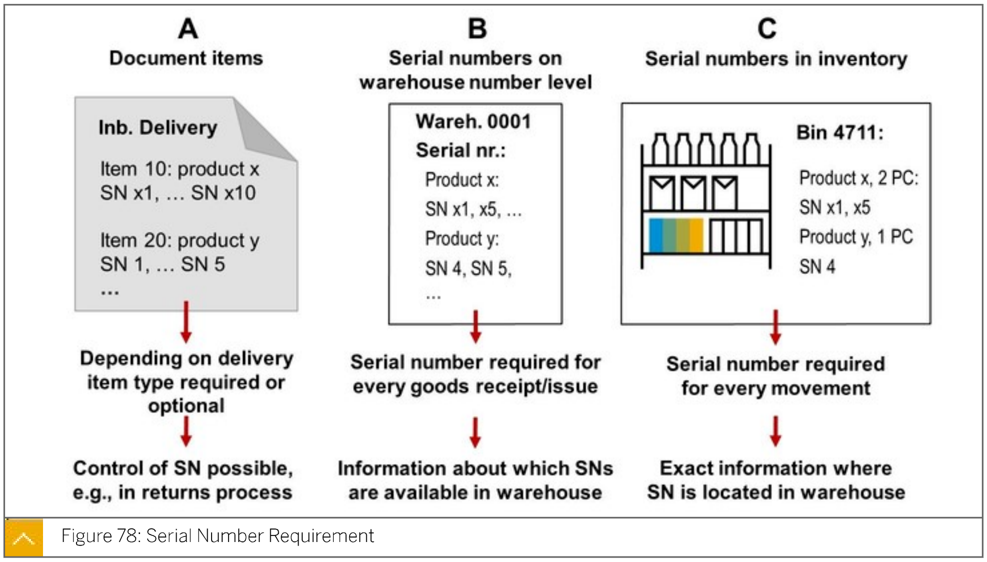

A
Document items
Inb. Delivery
Item 10: product x
SN x1, … SN x10
Item 20: product y
SN 1, … SN 5
…
Depending on delivery item type required or optional
Control of SN possible, e.g., in returns process
B
Serial numbers on warehouse number level
Wareh. 0001
Serial nr.:
Product x:
SN x1, x5, …
Product y:
SN 4, SN 5,
…
Serial number required for every goods receipt/issue
Information about which SNs are available in warehouse
C
Serial numbers in inventory
Bin 4711:
Product x, 2 PC:
SN x1, x5
Product y, 1 PC
SN 4
Serial number required for every movement
Exact information where SN is located in warehouse

Figure 78: Serial Number Requirement

Serial Number Requirements

Serial numbers for document items

You record serial numbers in inbound deliveries or outbound deliveries, but you have no visibility about the actual location of a product. Depending on the item type of the delivery, you can make the entering of the serial number mandatory.

As a simple example, you can use this in a returns process to control if the serial number corresponds to the number you sent with an outbound delivery to the customer.

Serial numbers at the warehouse number level

This serial number requirement provides you with an overview of which serial numbers are available in your warehouse. In every inbound and outbound delivery, you enter the serial numbers for the products for which it is required.

Serial numbers in inventory management

You use this serial number requirement to store exact storage bin information for a serial number. Every movement in the warehouse– inbound, outbound, or internally– requires the entering of the serial numbers for the products.

Serial Number Profiles

To enter a serial number for a product, you create serial number profiles and assign them to the materials. For working with serial numbers in SAP EWM, you need two different serial number profiles for a material.

ERP Serial Number Profile

You have a serial number profile in ERP, which does not relate to the serial number profile in EWM. This profile is required so that you can work with serial numbers in any document in ERP (such as deliveries).

The serial number profile in ERP controls the following:

- The serialization procedure for the profile defines the transactions for which serialization is possible. Examples include MMSL Maintain goods receipt and issue document, POSL Serial numbers in purchase orders, and SDLS Maintain delivery.
- **Serial number usage** defines whether serialization is mandatory or optional.
- The **equipment required** function specifies whether a piece of equipment is required.

The serial number profile can be allocated to different transactions with different parameterization.

You assign the ERP serial number profiles to the materials for which you want to maintain serial numbers. This is done in the material master either on the *Sales: General/Plant* view or on the *Plant data / stor. 2* view.

EWM Serial Number Profile

You also assign an EWM serial number profile to the material master in ERP. This profile is entered on the *WM Execution* view.

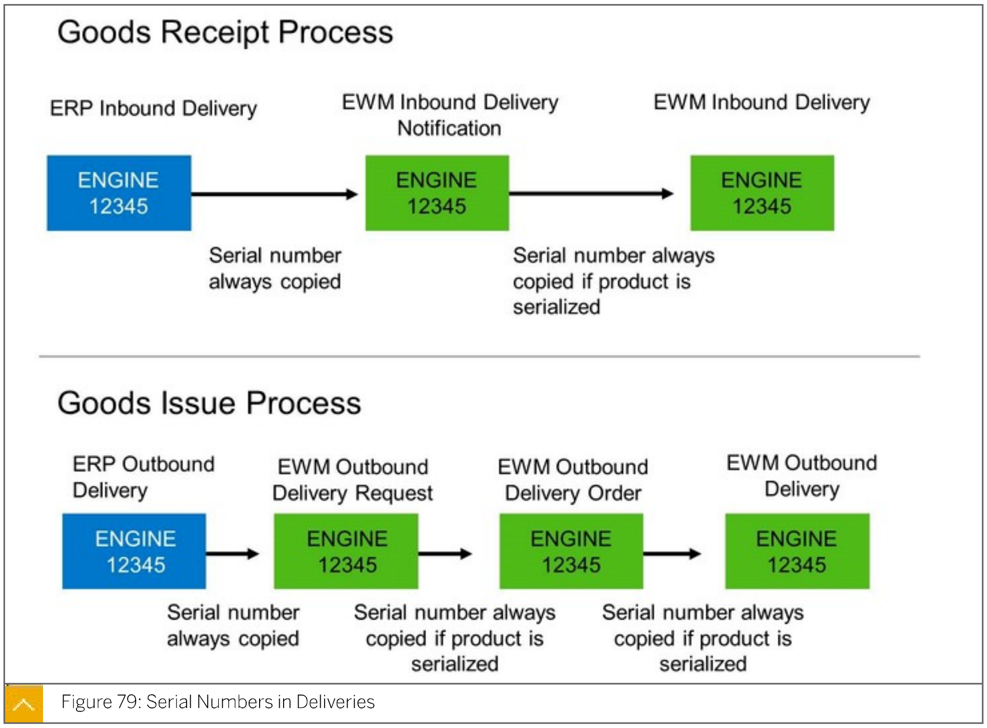
When you transfer the material master using CIF, this profile is also transferred and can be found on the *Storage* tab.

You have to define this EWM serial number profile in ERP and in EWM customizing with the same name and the same settings. In this profile, you set the **serial number requirement type**

The EWM serial number profile entered in ERP is **warehouse-number independent**. You can additionally have a **warehouse-number dependent** serial number profile with the same name in EWM that overrides the warehouse number independent profile. In this way you can, for example, control that a certain product only has mandatory serial numbers in a specific warehouse, or that in certain warehouses no serial numbers are required.

Usage of Serial Numbers in the Delivery

If you enter a serial number for a product in an inbound or an outbound delivery in ERP, EWM copies the serial number into the inbound delivery notification or the outbound delivery request and further on into the inbound delivery or the outbound delivery order. A prerequisite for this is that you have determined the serialization for the product in the serial number profile. Otherwise, EWM does not copy any serial numbers to the inbound delivery or the outbound delivery order.



Goods Receipt Process

ERP Inbound Delivery → EWM Inbound Delivery Notification → EWM Inbound Delivery

Serial number always copied

Serial number always copied if product is serialized

Goods Issue Process

ERP Outbound Delivery → EWM Outbound Delivery Request → EWM Outbound Delivery Order → EWM Outbound Delivery

Serial number always copied

Serial number always copied if product is serialized

Serial number always copied if product is serialized

Figure 79: Serial Numbers in Deliveries

Serial Numbers in Inbound Deliveries

You either receive the serial number in the advanced shipping notification of your supplier, you enter them in the inbound delivery in ERP (manually scan them or create them), or you enter them in the inbound delivery in EWM.

In the EWM serial number profile, you can define the object name and the number range for serial numbers created in EWM, as well as a prefix (optional).

Hint:
In EWM, you can specify a serial number with a maximum length of 30 characters. If you want to use data records for master data in the ERP system, the serial number in EWM can only have 18 characters (because the serial number in ERP has this maximum length). If necessary, you can use the Business Add-In (BAdI) **Converting Serial Numbers ERP – EWM(/SCWM/EX_ERP_SN)** for mapping the serial number between the ERP system and EWM. This allows you to work with 30-digit serial numbers in EWM and shorter numbers in ERP.

Provisional Serial Number

If you set the serial number requirement at the warehouse number level or in inventory management, Extended Warehouse Management always requires the serial numbers **before the goods receipt posting** If you set the *Prov SNs* indicator in Customizing, EWM automatically assigns a provisional serial number, if you have not already entered a valid serial number. You replace this serial number with your own in a subsequent goods receipt process.

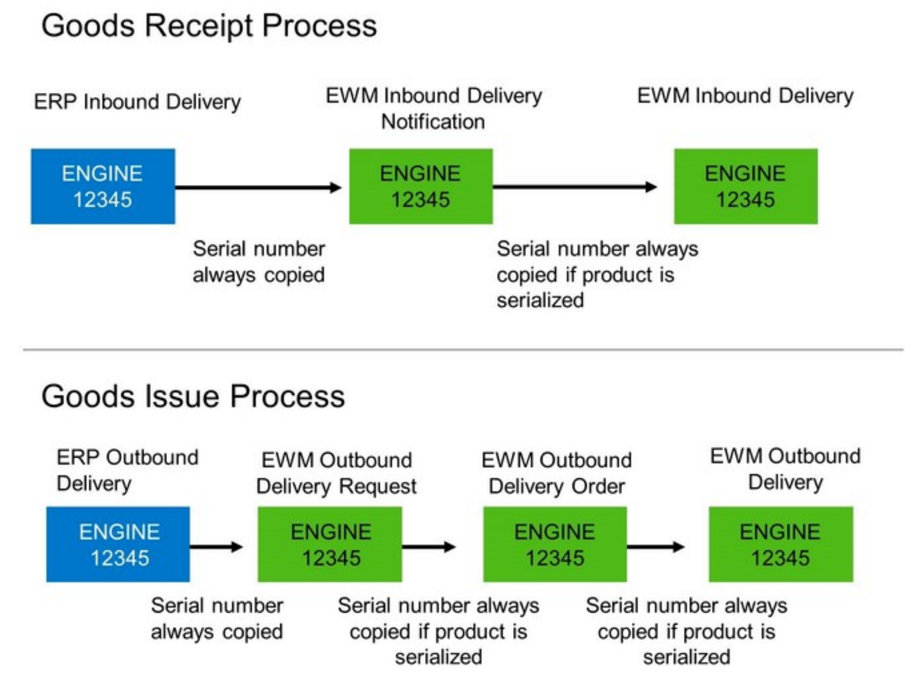

Goods Receipt Process
ERP Inbound Delivery
EWM Inbound Delivery Notification
EWM Inbound Delivery
ENGINE 12345
ENGINE 12345
ENGINE 12345
Serial number always copied
Serial number always copied if product is serialized
Goods Issue Process
ERP Outbound Delivery
EWM Outbound Delivery Request
EWM Outbound Delivery Order
EWM Outbound Delivery
ENGINE 12345
ENGINE 12345
ENGINE 12345
ENGINE 12345
Serial number always copied
Serial number always copied if product is serialized
Serial number always copied if product is serialized

Figure 79: Serial Numbers in Deliveries

Serial Numbers in Inbound Deliveries

You either receive the serial number in the advanced shipping notification of your supplier, you enter them in the inbound delivery in ERP (manually scan them or create them), or you enter them in the inbound delivery in EWM.

In the EWM serial number profile, you can define the object name and the number range for serial numbers created in EWM, as well as a prefix (optional).

Hint:
In EWM, you can specify a serial number with a maximum length of 30 characters. If you want to use data records for master data in the ERP system, the serial number in EWM can only have 18 characters (because the serial number in ERP has this maximum length). If necessary, you can use the Business Add-In (BAdI) Converting Serial Numbers ERP – EWM (/SCWM/EX_ERP_SN) for mapping the serial number between the ERP system and EWM. This allows you to work with 30-digit serial numbers in EWM and shorter numbers in ERP.

Provisional Serial Number

If you set the serial number requirement at the warehouse number level or in inventory management, Extended Warehouse Management always requires the serial numbers before the goods receipt posting If you set the *Prov SNs* indicator in Customizing, EWM automatically assigns a provisional serial number, if you have not already entered a valid serial number. You replace this serial number with your own in a subsequent goods receipt process.

Note:
If you want to track information about serial numbers in the ERP system, do **not** use provisional serial numbers. As soon as you use provisional serial numbers and replace them with your own serial numbers at a later point in time, EWM no longer reports these serial numbers to the ERP system, meaning that the ERP system does not have up-to-date information regarding the status of the serial numbers in EWM.

Serial Numbers in Outbound Deliveries

You either enter the requested serial numbers in the outbound delivery (or in the sales order) and this information is taken to pick the requested serial number, or you assign the picked serial numbers when confirming the warehouse task. If you confirm a warehouse task in the foreground, you can assign serial numbers manually. If you confirm a warehouse task in the background, EWM automatically assigns the serial numbers known to the system if a complete quantity removal occurs.

Entering Serial Number Ranges

When working during putaway or picking in the RF environment, you can specify whole serial number ranges instead of individual serial numbers.

Select *Range* on the entry screen for serial numbers. EWM displays a new screen where you can enter the start and end values for your serial number range. On this screen, EWM also displays the data for the product, the number of serial numbers necessary, and the number of serial numbers that already exist. When you have specified the serial number area, EWM updates the number of existing serial numbers accordingly. EWM displays the serial number range in a step loop and you can then specify the next serial number range.

LESSON SUMMARY

You should now be able to:

- Work with serial numbers

Unit 7
Lesson 2

Kitting in EWM

LESSON OVERVIEW

In this lesson, you learn about kits and kitting, and kit-to-order.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe the different kitting scenarios
- Set up a kit-to-stock process

Kits and Kitting

A kit is a list of products that are always delivered in complete and assembled form. Kits can consist of a group of materials used to repair a piece of machinery, add-on products for other products, or an assortment of products to sell in a retail store.

SAP EWM does not save the kits as master data; instead it receives the information about the structure of a kit in the form of items of an outbound delivery from the SAP ERP system. The structure containing the kit in the outbound delivery, in combination with a packaging specification, is used as a basis for assembling or producing a kit in SAP EWM.

Kit Header and Components

A kit can consist of the following levels:

- A kit header represents the finished kit.
- A kit component is a product in the kit.

The process of building or assembling kits is called kitting. SAP EWM supports the **kit-to-order** and the **kit-to-stock**kitting processes. In the kit-to-order process, each kit is assembled based on a customer order. SAP EWM also provides a kit-to-stock process in which kits are pre-assembled and placed into stock.

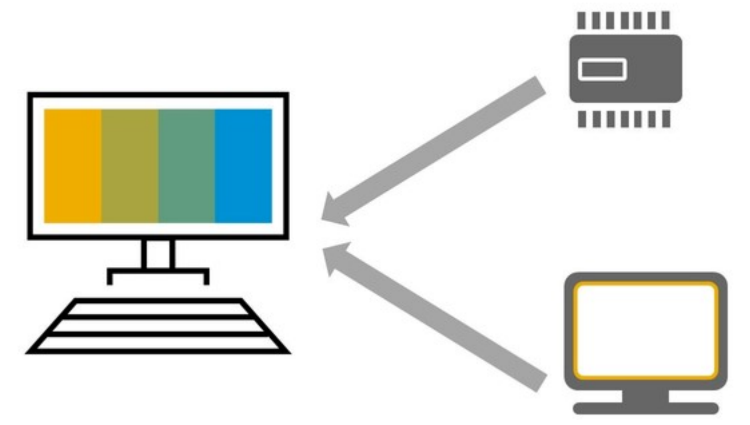


Figure 80: Kit Header and Kit Components

Kit-to-Order

With the kit-to-order process, you can automatically assemble kits in the system if there is no kit in stock.

The following rules apply to kits:

- A kit is always delivered in full to a customer.
- The kit header and kit components are always scheduled for the same date.
- All components for the kit must come from the same warehouse (this can be achieved by means of an internal transfer between warehouses).
- Kit prices are always calculated at the header level.
- The kit header and kit components have a quantity ratio, defined by the kit structure, to each other. This quantity ratio is recalculated as soon as there are changes at kit header level or at kit component level.

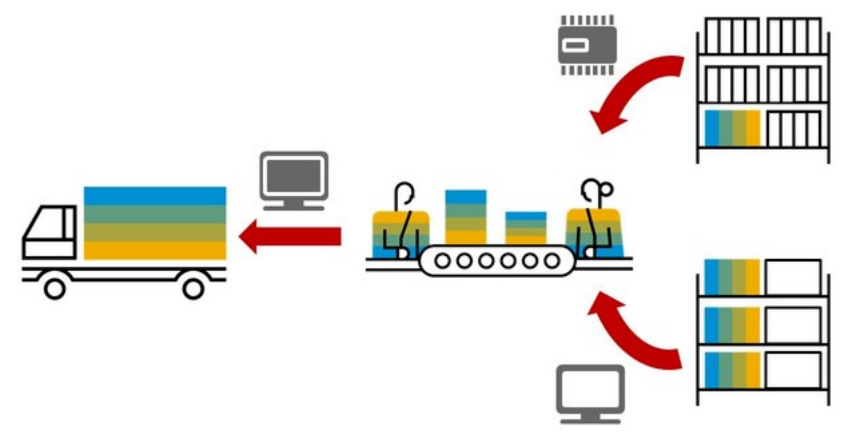


Figure 81: Kit-to-Order

Kitting at a Work Center with a VAS Order

You can use this process to create a kit with a VAS order.

This provides you with the following VAS order options:

- Working with a special kitting work center
- Automatic determination of the kitting work center
- Integrating VAS processing into the delivery

This process requires a packaging specification for the product of the kit header item as master data, so that you can create a VAS order. This packaging specification must have a level of the level type *Kitting*. If you are using process-oriented storage control, you must assign the corresponding warehouse process step (such as KIT) of the warehouse process used to the kitting level.

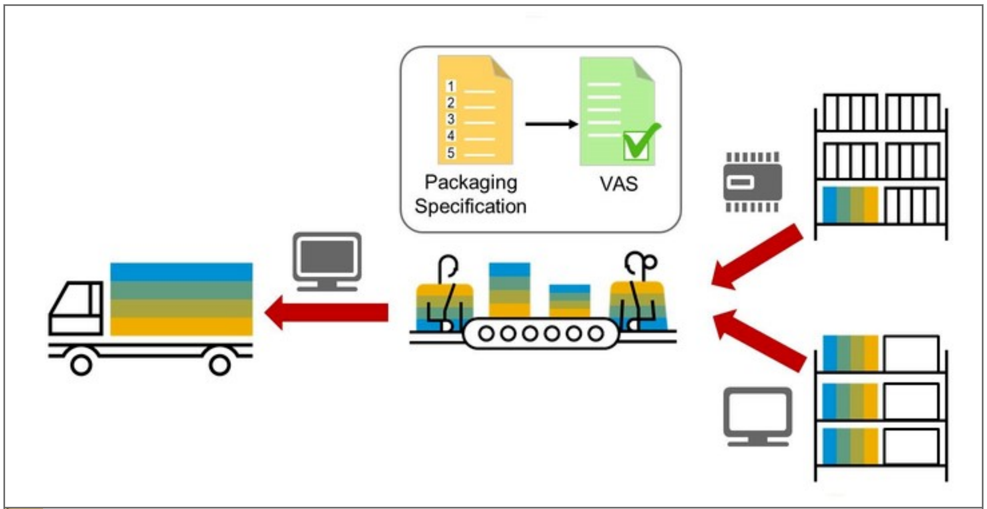


Figure 82: Kitting at a Work Center with a VAS Order

Kitting at a Work Center Without a VAS Order

You can use this process to create a kit without a VAS order at a work center. You can configure a work center where you also pack in such a way that you can confirm generated kits there.

This process is suitable for the following cases:

- You do not require detailed documentation of the kitting procedure in EWM.
- You are not performing kitting in one special kitting work center, but at a work center where you are also packing.

  You can only find information about kitting in the information for the kit in the outbound delivery, and in the kitting instruction that may exist in the form of free text for the warehouse request item of the kit.

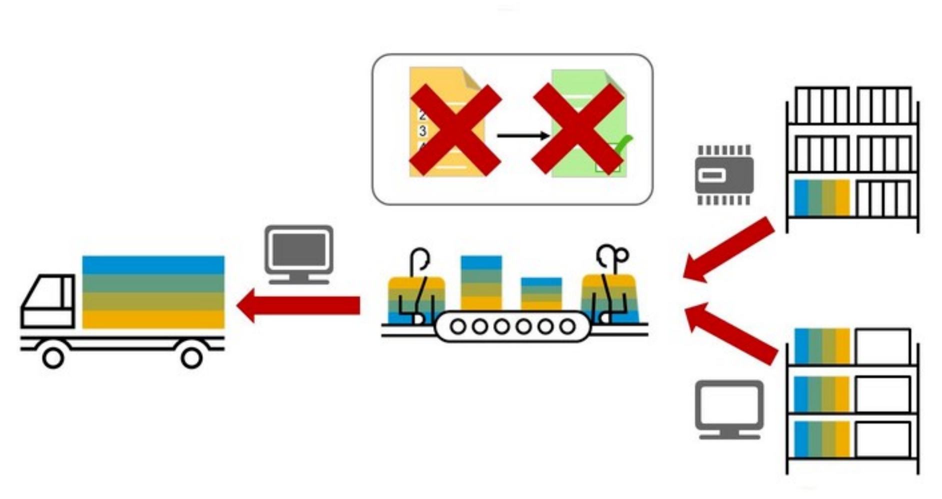


Figure 83: Kitting at a Work Center

Kitting During Picking Without a VAS Order

You can use this process in SAP EWM to create a kit during picking. This process is suitable for the following cases:

- You do not require detailed documentation of the kitting procedure in EWM.
- You assemble the kits during picking, that is, you do not perform kitting at special work centers.

  Without a VAS order, you can only find information about kitting in the information for the kit in the outbound delivery and in the kitting instruction that may exist in the form of free text for the warehouse request item of the kit header.

  You can use an indicator for the item type of the kit header to make the system generate an item for the kit header in the pick HU.

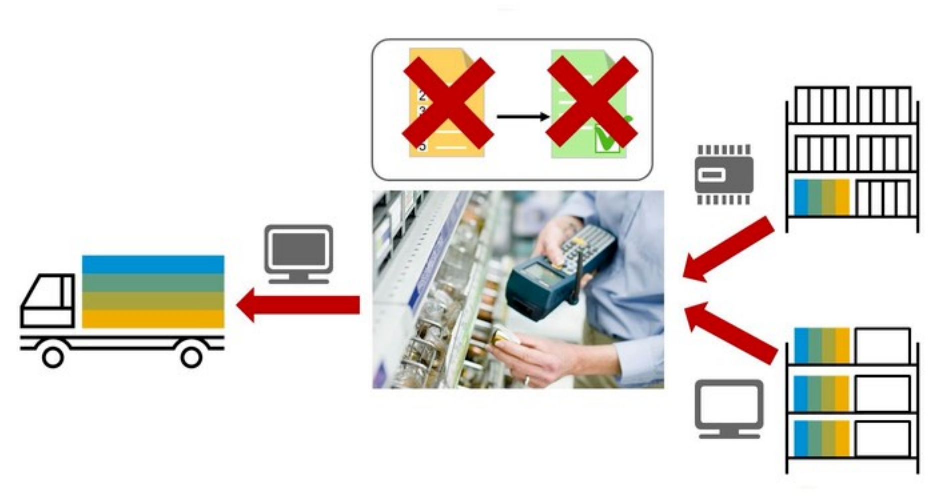


Figure 84: Kitting During Picking

Kit-to-Stock

You can use this process to create kits and then transfer them to stock. This provides you with a streamlined kit creation process that is executed and documented in the warehouse. You can either trigger kit creation manually in the SAP ERP system, based on a production order, or in the SAP EWM system directly using a VAS order.

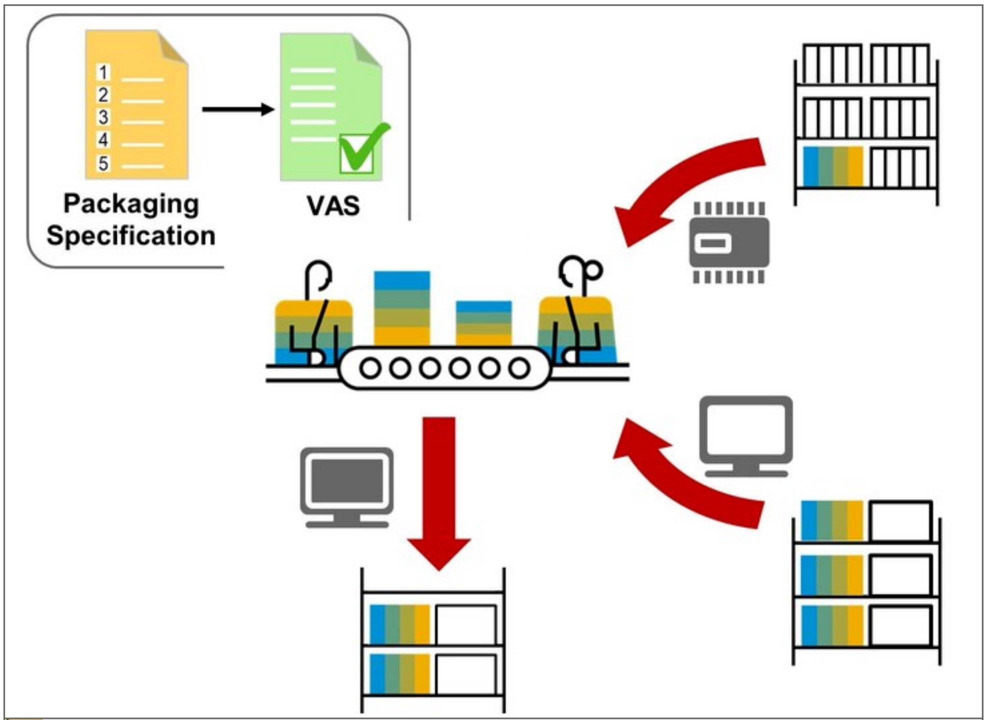


Figure 85: Kit-to-Stock

Start in the ERP System

You start the kit-to-stock process in the ERP system by creating a production order manually, or by having one generated automatically from planning. The main prerequisite is the indicator *Kit-to-Stock in EWM* in the production scheduling profile.

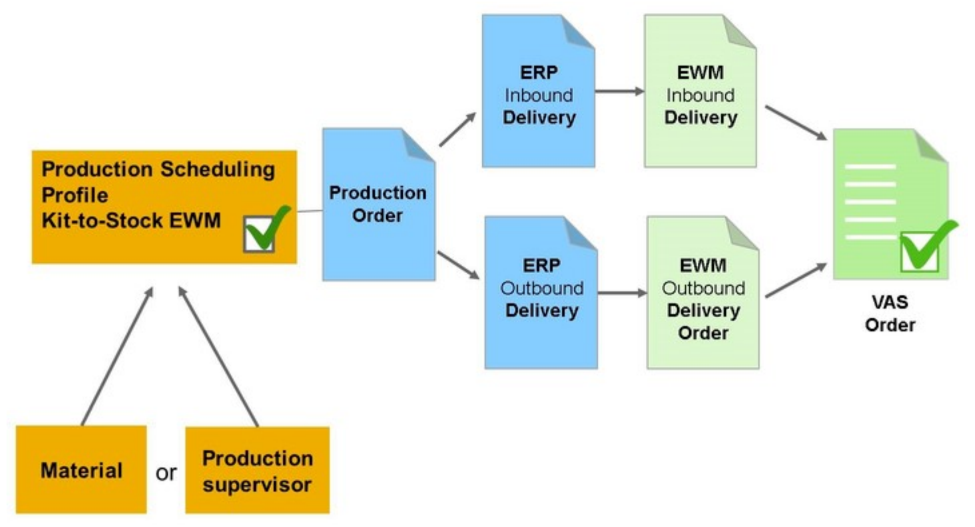


Figure 86: Kit-to-Stock ERP Process

Based on the production order, the ERP system generates an inbound delivery for the kit header, and an outbound delivery for the kit components. The system transfers both deliveries to the EWM system. The EWM system first generates the outbound delivery request and the outbound delivery order, it then generates the inbound delivery notification and the inbound delivery. A PPF action, which triggers automatic creation of the VAS order, is defined for the inbound delivery.

You can find the document number of the VAS order in the form of a document flow entry for all items of the inbound delivery and outbound delivery order.

During confirmation of goods issue of the kit components and of goods receipt of the kit in the EWM system, goods receipt and goods issue are automatically confirmed to the ERP system.

Start in the EWM System

For starting the process in the EWM system you create the VAS order manually with or without a bill of material. If you create a VAS order with a bill of material, the system attempts to find and explode a bill of material in the ERP system for the kit product. If you create a VAS order without a bill of material, you must specify the kit components manually, as well as the kit product.

The system generates an inbound delivery for the kit header, and an outbound delivery for the kit components. Both deliveries are transferred to the ERP system and deliveries are created there accordingly.

Kit-to-Stock Settings

It is necessary to define, in the EWM customizing, an order type for the VAS order and to assign the document types and item types for the inbound and outbound documents.

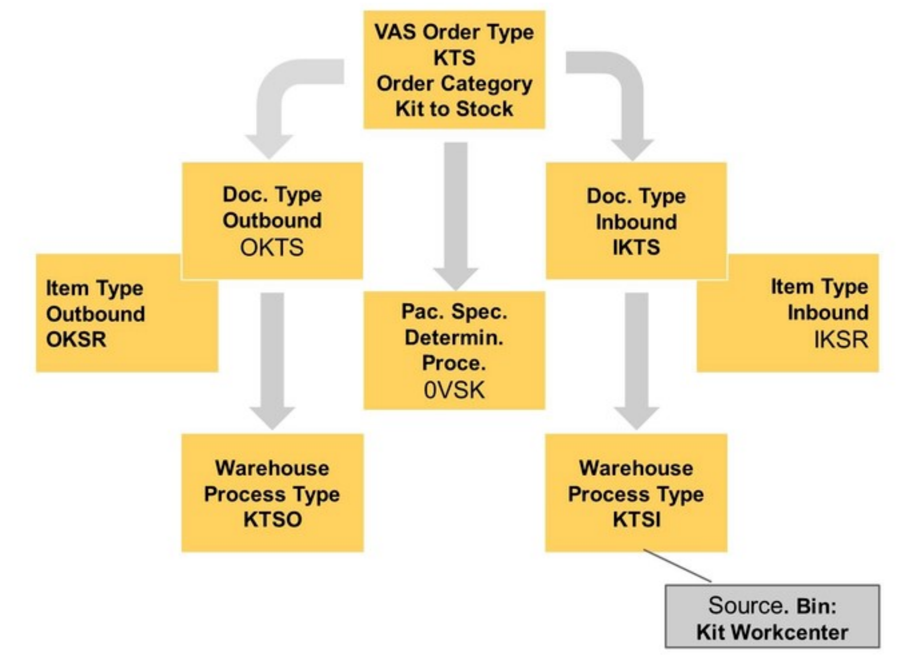


Figure 87: Kit-to-Stock Settings

Note:
These settings are necessary for both process variations, if the process is started in SAP ERP as well as in SAP EWM.

Reverse Kitting

You can also perform reverse kitting, which you can use to split a kit back into its components. In connection with SAP EWM, this process can only be triggered from the EWM side.

LESSON SUMMARY

You should now be able to:

- Describe the different kitting scenarios
- Set up a kit-to-stock process

Unit 7

Learning Assessment

1. A serial number is a character string that is given to a product to differentiate the individual piece from all the other pieces.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

2. A kit is a bill of material that is always delivered completely and assembled.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

3. A Kit-to-stock process can only be started in SAP ERP.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

Unit 7

Learning Assessment - Answers

1. A serial number is a character string that is given to a product to differentiate the individual piece from all the other pieces.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

   That is correct. A serial number is a character string that is given to a product in addition to a product number to differentiate the individual piece from all the other pieces.

2. A kit is a bill of material that is always delivered completely and assembled.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

   That is correct. A kit is a list of products that are always delivered in complete and assembled form.

3. A Kit-to-stock process can only be started in SAP ERP.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False